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DAIRY, FOOD AND ENVIRONMENTAL

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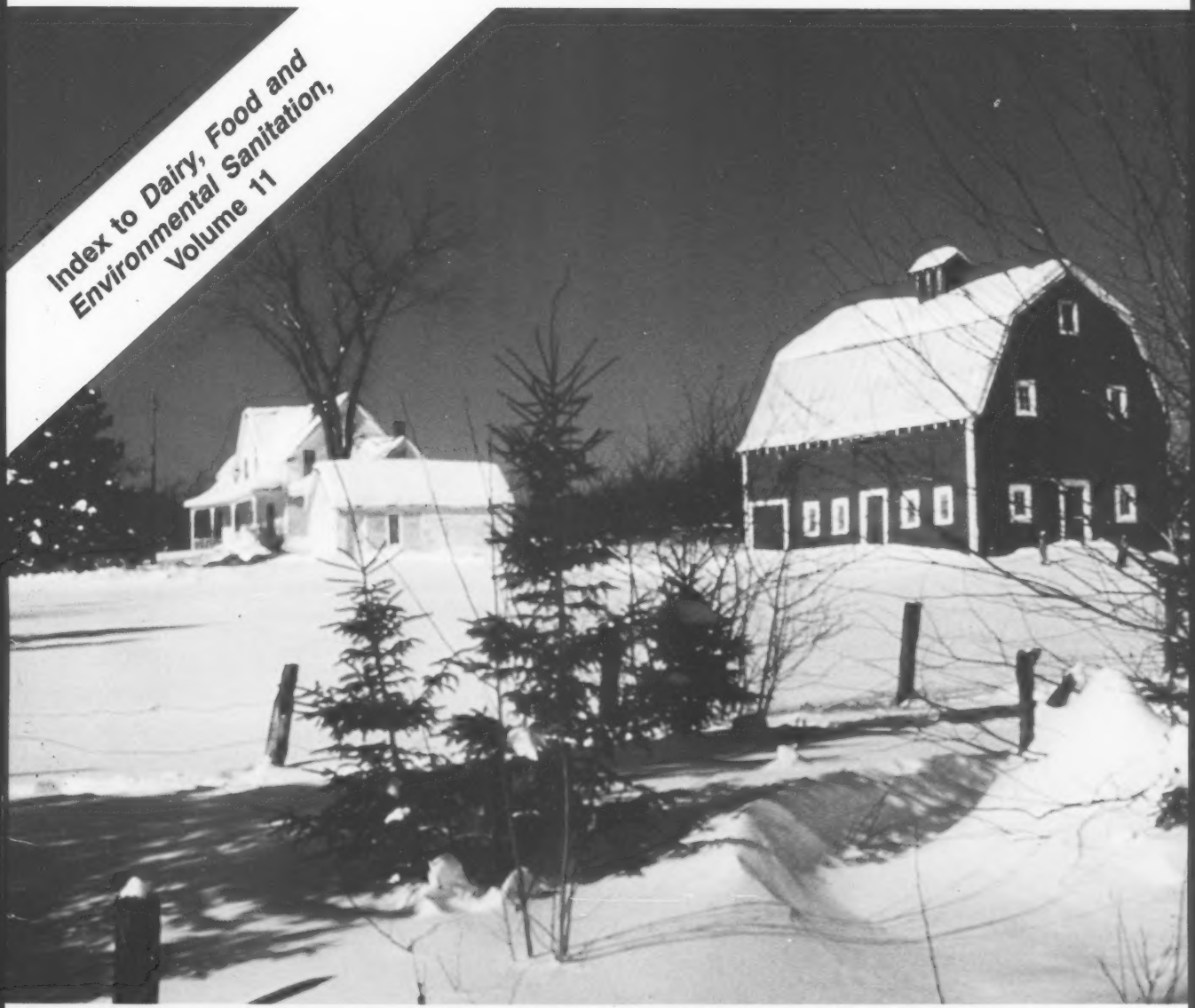
DECEMBER 1991

Index to Dairy, Food and Environmental Sanitation, Volume 11



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Announcement
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Awards

Five (5) awards will be presented: 1st place, $500 and a plaque; 2nd place, $200 and a certificate; 3rd place, $100 and a certificate; 4th place, $50 and a certificate; 5th place, $50 and a certificate. All of the winners will receive a 1 year membership including both *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection.*

Purpose

1. To encourage graduate students to present their original research at the IAMFES annual meeting.
2. To foster professionalism in graduate students through contact with peers and professional members of IAMFES.
3. To encourage participation by graduate students in IAMFES and the annual meeting.

Who Is Eligible

Graduate students enrolled in M.S. or Ph.D. programs at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

Criteria

1. A short abstract of the paper must be submitted to the IAMFES office by December 16, 1991. (Use the blue abstract forms from the September issue, if possible).
2. The author must indicate on the abstract form the desire to be considered for the competition.
3. The paper and the student must be recommended and approved for the competition by the major professor or department head.
4. The paper must represent original research done by the student and must be presented by the student.
5. An extended abstract form will be sent to all who enter the competition, and must be completed and returned by the deadline date on that form.
6. Each student may enter only one (1) paper in the competition.
7. Papers are to be presented as oral papers and should be approximately fifteen (15) minutes in length with an additional five (5) minutes allowed for questions, for a total of twenty (20) minutes.
8. The use of slides or other visual aids is encouraged.
9. **All students with accepted abstracts will receive a complimentary membership which includes their choice of *Dairy, Food and Environmental Sanitation* or the *Journal of Food Protection.***
10. The papers will be judged by an independent panel of judges.
11. Winners are presented and honored at the annual Awards Banquet. All entrants will receive complimentary tickets and are expected to be present at the Banquet.

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On My Mind . . .

By
Steven K. Halstead
IAMFES
Executive Manager

. . . perception versus reality

I have been thinking about this for quite some time, but a speaker I heard at the New York State Association of Milk and Food Sanitarians pushed me over the edge.

The speaker, a representative of a group calling itself New York Alternatives to Pesticides, spoke on the topic "The Hazards in Food." The program committee chose the speaker because they felt that it would be good for sanitarians/scientists to hear the other side (read that non-scientific) of the safe food issue.

And hear it they did. Starting with half-truths and innuendos, the speaker proceeded to severely chastize the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA), and the U.S. Department of Agriculture (USDA). However, she was just as quick to use these sources as authoritative whenever it suited her needs. She ended up using dated data or if necessary just plain ignoring conflicting data.

The thing that scared me the most was that this was not an isolated speaker or incident. There are many, many people just like her and they are continually getting tremendous coverage in the media. You might ask yourself why.

First off, this country is rapidly becoming scientifically ignorant. We continually hear that "Johnny can't read or write." We know that he can't do math. I suggest that if the present day high school graduate can't read, write or do math, he/she also can't do science. If they can't do science, they can hardly be expected to differentiate between science and pseudo-science.

We now have a generation (maybe two) which believes that humans were alive at the same time as dinosaurs (elementary schools' most popular study topic), that animals (Garfield and Snoopy) can talk, and that if animals, which ingest pounds of test materials per pound of body weight per day, develop cancers from that material then we will also, by ingesting more reasonable amounts.

Advertising and the "American Way" often encourages these misconceptions. Take, for example, biodegradable plastics. Biodegradable plastic was seen as the solution to our solid waste problems. We were told that, given time, the materials would return to the soil. All you had to do was put corn starch in the plastic. (Iowa corn farmers liked that idea!)

The problem was, sunlight was needed. Without sunlight, the life of that biodegradable plastic bag was 300 years. Consumers, encouraged by radical environmentalists, felt they had been had.

In a democracy, perception can become reality and that reality can become law.

Encouraged by their "victory" the radicals continued to push the idea that plastics were a big landfill problem. Ignoring the scientific data, city councils and legislatures began outlawing plastic packaging. In so doing, they also ignored food safety concerns.

The public perceived that plastic was a problem. The lawmakers perceived that the public wanted something done, and did what they perceived would solve the problem. Thus, several cities have outlawed the use of plastic packaging in the fast food industry. Others are considering it.

In a democracy, perception can become reality and that reality can become law.

I perceive that those of us within the scientific community can make a difference. To do that, we are going to have to educate the public and the legislators. I challenge you to help me make my perception a reality.

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A Comparison of Traditional Inspection, HACCP, S.A.F.E. and SCAP in a Chinese Style Restaurant

Satyakam Sen, M.A., M.S., D. Phil, 80 Dogwood Lane, Bristol, Connecticut 06010

Introduction

The food service operator in a retail food service establishment is confronted with endless issues and tasks to be performed for the customer's satisfaction. A safe food supply for the customer is a prelude to the impact on health because all food-body interaction begins after the consumption of food. The retail food service establishment is a primary health care site where "health is made or broken."(1) The application of scientific knowledge and high technology in food production, processing, distribution and the operational processes at the food service operation site has created unknown risks. The need for an assessment of health parameters should be the requisite for an effective evaluation of the customer's health profile as related to the ingestion of food.

The government's major concern in public health activities during the last several decades were food sanitation, food hygiene and food protection, in order to enhance the public confidence of safe food supply for the customers. The regulatory agencies have focused their attention on providing a clean environment and food that is safe for the consumers in all retail food service establishments. The strategy of regulatory compliance is the monitoring and surveying of food services by the traditional spotcheck inspection, HACCP, SCAP and S.A.F.E. to determine whether any food contamination is due to environmental factors and food handling practices in the servicing end of the food chain process. The Self Care Action Program or SCAP is formulated and designed to address the aspects of health (prevention, promotion and intervention) relating to a customer's food intake and its relation to his/her health and well-being. The purpose of this paper is to discuss the pros and cons of existing techniques and approaches which can be applied to a retail take out food service establishment by examining the preparation of fried rice (Chinese style).

Food Borne Disease Prevention Programs

During the later half of the nineteenth century, local, county and state health departments have taken an active interest in preventing food borne disease outbreaks. The emphasis in the past and in the present, especially at the local level, is to block the epidemic pathways of food borne illnesses. In essence, the basic interest of regulatory agencies is to provide a food sanitation program that will assure the public that the food is safe. The clean and sanitary environment of the food supply and the blocking of the transmission route of pathogenic bacteria has been a primary concern. Later on, the emphasis is on reducing or eliminating the contamination risk factors of the potential growth of disease-causing microorganisms. The traditional snapshot inspection and application of HACCP, S.A.F.E. and SCAP became essential tools for monitoring and surveilling the food protection programs in a retail food service establishment.

Besides the provision of supplying safe food, customers have begun to seek satisfaction from balanced nutrition. The healing of disorders and diseases through selective or prescriptive diets make for qualitative living and a longer lifespan. As a result, government strategies are now directed towards the health care services to promote an "association between diet and health."(2) The four approaches, traditional snapshot inspection, HACCP, S.A.F.E. and SCAP in a food service establishment, are preventive practices. But in case of a Self Care Action Program (SCAP), the food service manager or operator has volunteered to introduce it by focusing on the three predominate health care service areas; preventive, promotion and intervention in the retail food service establishment. A brief discussion of these four approaches will enable us to understand and analyze the significance of the application of these methodologies, from the perspective of effective health care services for the customers benefit.

The Traditional Snapshot Inspection

The inspection procedure was adopted to evaluate the state of sanitary conditions and the contamination potentialities by making field observations which are recorded as citations of violation on the inspection report form. The items stated in the form should be in compliance with regulations, codes or ordinances. The routine traditional inspection in a limited timespan pinpoints any possible contamination from the environment to the food and any insanitary food handling practices. The snapshot inspection technique is subject to criticism due to unweighed risk factors and the difficulty in assessing the confounding

variables related to the epidemiologic causation factors. The preventive measures are rarely effective because "certain items in regulations are not specific"(3) and the inspection is based on value judgement consideration rather than on evaluating the critical points of the growth phases of pathogenic microorganisms in the food chain process or preparation cycle.

Many food service operators and consultants believe that it is easy to satisfy health department officials because the "three areas where health inspectors focus their attention are floors, walls and ceilings."(4) Food service operators who are associated with food services in a retail establishment, are bewildered due to the fact that numerous enforcement agencies in the country are trying to prove their effective food protection services to the taxpayers that by increasing the frequency and number of snapshot inspections, supported by computerized data collection, and enforcing strictly the observed violations cited in the checklist. The food service operator sometimes reluctantly accepts the inspector's citation and attempts to correct the problem in order to prevent food borne outbreaks and especially the adverse publicity and fear of economic losses.

Hazard Analysis Critical Control Point (HACCP)

The concept of HACCP was launched by NASA and Natick Laboratories in the early sixties with the cooperation of the Pillsbury Company to supply safe food products to be used by the astronauts in space. The Pillsbury Company concluded that the microbial control of the food chain process could be achieved by constant monitoring and surveillance. The objective to minimize bacterial contamination in the food would strengthen the public confidence and promote the principles for the sound foundation of the food safety program. The food safety record of Pillsbury Company inspired the food manufacturing industry to adopt the HACCP system for the successful implementation of the production of safe and wholesome food. During the eighties, HACCP became a movement in the U.S.A. and later on was accepted by food scientists and microbiologists worldwide who were engaged in industry, regulatory agencies, academic pursuits and various professional and international organizations. There is a strong tendency to implement HACCP by its proponents as a regulatory vehicle for monitoring retail food service establishments when the food service industry is facing a crisis and a challenge due to the emergence of a global market which could mean severe competition at all levels and involve a large number of customers worldwide.

The push for the implementation of HACCP to be an adopted concept at local, county and state regulatory agencies to replace the traditional inspection system, is due to the recognition of it as "the concept of combined principles of food microbiology, quality control and risk assessment to obtain as nearly as possible a fail safe system"(5) for an effective surveillance program in a retail food service establishment to prevent food borne disease outbreaks and epidemics. The description of the concept of the Hazard Analysis Critical Control Point is given by the Food Safety and Inspection Services (FSIS) in a glossary of terms as "a specific inspection approach to control biological, chemical, physical and/or economic, adulteration in foods. It is a two part process done on a product by product, or process by process basis. The first deals with defining the consumer hazards associated with a specific food product relative to the intended end use of the product. The second part deals with flow charting each operational step of the food manufacturing process, defining the hazard associated with each step and assessing its relative importance. Also identifying the critical control points of the manufacturing process, determining the control measures can be used to eliminate or reduce the hazard to acceptable levels, determining the monitoring procedures either by observation or measurement to determine the specific manufacturing records necessary for monitoring to ensure that hazards are being controlled, and identifying the necessary verification procedures."(6)

The objective of HACCP is to prevent the contamination of food and to gain public confidence by providing safety assurance of the specific food in a specific process line of the linear food flow process where food handling practices predominate and the potentialities for growth of pathogenic organisms may arise and create "a chance to increase by large numbers"(3) of a microbial population. HACCP relies on specific criteria based on field observations to control the bacterial population by inhibiting, killing, destroying or reducing by some other means.

HACCP is an effective surveillance and monitoring system to prevent food contamination and is more objective than the checklist inspection system. It is very suitable for processing plants and industry but from the primary health care services viewpoint, HACCP could be of great value for the prevention of food borne illness, but only at a huge cost of the food service workers time. One should remember and take into consideration that in a real world situation, the operational mechanisms in the food preparation cycle, where intense food handling practices are involved, depends greatly upon quality production, food volume, time, quantity of sales, food service workers' skills and other visible and invisible factors.

S.A.F.E.

S.A.F.E. is an abbreviation for the Sanitary Assessment of Food Environment introduced by the National Restaurant Association (N.R.A.) which is essentially an auditing system based on the concept of self-regulation through self-inspection. N.R.A. describes S.A.F.E.(7) as a "streamlined version" of HACCP and a new approach to inspection which monitors three principles; "keep it clean", "keep it hot" and "keep it cold" through self inspection guidelines. The focus of S.A.F.E. is on the food preparation cycle. S.A.F.E. accepts both the objective and the subjective observations relating to the food-health issues that "most food borne illnesses are caused by human error, when people take short cuts or bypass good procedures"(8) and recommends the rejection of food products when it does not meet required standards.

The distinct features of S.A.F.E. are the sequential acts of food service personnel from the product delivery point to serving end. Its emphasis is on the assessment of the relative risks of menu items, than measuring the potential hazards in a linear flow process of HACCP. The survey of the entire

process of food preparation gives the clue to human errors and abuses. The S.A.F.E. action begins with a menu review for selecting the food items for a survey of the entire process of the food service activity, continues with the construction of a flow diagram; to find out where the food handling stimulates the pathogenic bacteria to grow. Those human errors and abuse sites coinciding with the pathogenic bacterial growth factors are identifiable points which are included in the procedures of a self-inspection schedule and also in the food service workers job description.

S.A.F.E. is a very simple procedure addressing "people's problems"(9) in a people's way. It is a positive step towards health care services to customers in a retail food service establishment which is a primary health care site.

Health Care Oriented Food Services

The formation of the World Health Organization (WHO) and the incorporation into its constitution the definition of health as a "state of complete, physical, mental and social well-being and not merely the absence of disease or infirmity"(10) has established the role of comprehensive health care services instead of just a clinical remedy. WHO also enthusiastically started promoting the idea of providing basic health care services for all by attacking the problem through primary health care. (11) The food service establishment is a primary health care site, because it is here at the food consumption point where the customer's food-body interaction begins.

Therefore, the health care delivery system provided by the food service manager or operator, should be addressed not only for preventive factors associated with food safety but also for promotive and interventional activities which will be designed for the customer's health and well-being.

The Self Care Action Program or SCAP activities are based on the voluntary efforts of all participants. The success of SCAP depends on the cooperation of all who are involved with the consumption of food; workers, managers and customers.

Self Care Action Program (SCAP)

SCAP is based on the principles of self care health practices which continuously aspire for the improvement of the conditions of the food safety. The combination of economic gain for the owners and the health benefits for the customer should be the primary objective in implementing the program in a retail food service establishment. The application of procedures and techniques vary from establishment to establishment due to the consumer's health status, the food supply, and other relevant environmental conditions. SCAP establishes the management linkage between the food system and the operational processes in the best interest of the customer by applying human proficiency and the required skills. The Food Service Manager or Operator always looks forward to increasing the number of customers, the amount of sales and also by supplying the appropriate food for meeting the health status requirements of the customer. Sometimes it is extremely difficult to get accurate information for developing a menu to suit the customer's satisfaction from a health standpoint. After the menu is planned, the food substance or product is subjected to constant surveillance and monitoring by the Food Service Manager or Operator. The coordination of all activities minimizes errors, abuses, wasteful and faulty practices. Taking care of all potential risks and problems in the sequence or procedural steps of the food product consumption is the key to the success of the program. The determination of acceptance or rejection of the food substances is one of the principles of SCAP which intends to reduce the wastage of food substances and products. In each of the phases and sub-phases of SCAP there are points where the food is either accepted or rejected by the customer. The lesser the amount of rejection the greater the profit. SCAP as outlined consists of simple measures, procedures and solutions to the customer's health and well-being at the food consumption site.

Observations on the Different Approaches

A specific item, (fried rice) from a take-out restaurant specializing in Chinese style cooking was selected for observation of the four different approaches, namely Traditional Snapshot Inspection, HACCP, S.A.F.E. and SCAP.

The Chinese style take-out restaurant has a long list of menu items (125). Out of all menu items the total daily meals served is approximately 150-200 and out of these 125-160 is fried rice. All fried rice preparation includes potentially hazardous foods (shrimp, pork, beef, chicken and canned lobster) and is cooked stir-fry in oil. As fried rice is a take-out item, the customer's food intake point and time is unknown.

Traditional Snapshot Inspection

The site was inspected and violations were cited on an inspection report form three times. The restaurant failed in the initial inspection (the score - 78) to improve the sanitary conditions of the establishment but the score increased to 84 in the scheduled follow-up inspection. The score on a casual inspection a week later was 89 but then three months later the recorded inspection score dropped down to 77 (failing score). The observed food sanitation practices or nature of violations were as follows:

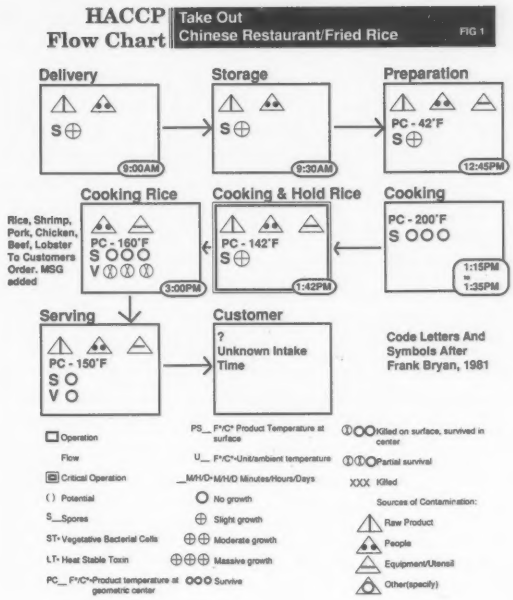
Food - Food handlers were not aware of risk factors associated with potentially hazardous foods.

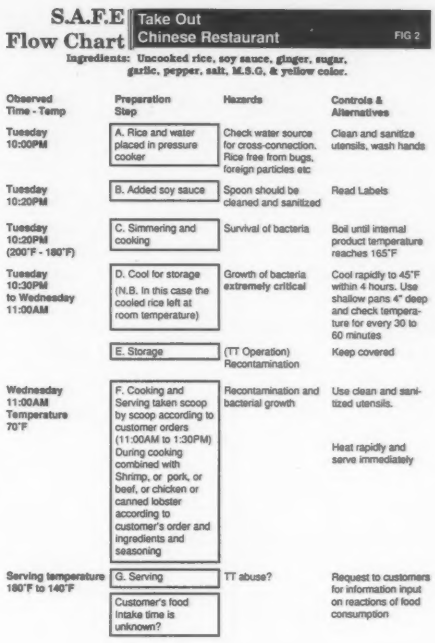
Food Handling - Contamination factors exist in food handling practices.

Facility - Unsanitary conditions are associated with poor housekeeping and lifestyle habits.

HACCP

The flow chart of HACCP for fried rice (see fig. 1) cooked in the above mentioned take-out restaurant follows a preparation cycle of six hours. It is important to note that the preparation of the potentially hazardous foods to be added in the fried rice was deboned and cleaned two days earlier than the observed preparation cycle and was held in a 6" plastic tray in the walk-in cooler. Besides the cooking step, manual handling of the food substances by the food service workers predominate in all other steps or processes. There is no reheating step of leftovers to be stored during




S.A.F.E Flow Chart
Take Out
Chinese Restaurant
FIG 2
Ingredients: Uncooked rice, soy sauce, ginger, sugar, garlic, pepper, salt, M.S.G, & yellow color.
Observed Time - Temp
Preparation Step
Hazards
Controls & Alternatives
Tuesday 10:00PM
A. Rice and water placed in pressure cooker
Check water source for cross-connection. Rice free from bugs, foreign particles etc
Clean and sanitize utensils, wash hands
Tuesday 10:20PM
B. Added soy sauce
Spoon should be cleaned and sanitized
Read Labels
Tuesday 10:20PM (200°F - 180°F)
C. Simmering and cooking
Survival of bacteria
Boil until internal product temperature reaches 165°F
Tuesday 10:30PM to Wednesday 11:00AM
D. Cool for storage (N.B. In this case the cooled rice left at room temperature)
Growth of bacteria extremely critical
Cool rapidly to 45°F within 4 hours. Use shallow pans 4" deep and check temperature for every 30 to 60 minutes
E. Storage
(TT Operation) Recontamination
Keep covered
Wednesday 11:00AM Temperature 70°F
F. Cooking and Serving taken scoop by scoop according to customer orders (11:00AM to 1:30PM) During cooking combined with Shrimp, or pork, or beef, or chicken or canned lobster according to customer's order and ingredients and seasoning
Recontamination and bacterial growth
Use clean and sanitized utensils.
Heat rapidly and serve immediately
Serving temperature 180°F to 140°F
G. Serving
TT abuse?
Request to customers for information input on reactions of food consumption
Customer's food intake time is unknown?

this fried rice preparation cycle. The HACCP critical control point appears to be in the cooling and holding step where the risk of contamination is greatest.

The HACCP flow chart identifies the significance of monitoring the cooling and holding steps where the risks of bacterial contamination could occur due to the food handler's personal behavior (sanitary habits), ignorance (unawareness of the role of transient bacteria in fingertips) and general cleanliness (e.g. ineffectively washed equipment). The unpleasant effect of fried rice on the customer's health may occur due to MSG (sensitivity factor) or microbial growth in the fried rice due to improper storage at room temperature. This is especially true if consumed after three or four hours (unknown intake time) by the customer.

S.A.F.E.

The S.A.F.E. chart (see fig. 2) is prepared from the results of self inspection and self regulation of the operational activities during the preparation food cycle. It has four columns: time-temperature observation (risk assessment), preparation steps of menu item (product conversion process), hazard potentialities (contamination occurrence) and controls and alternative (contamination resolving acts). It is simpler to analyze the processes in steps to understand how and when a wrong may occur and how preventive measures could be taken for the elimination of pathogenic microorganisms.

The preparation cycle of fried rice (Chinese style) began the day before it was served to the customer. The observed S.A.F.E. survey shows that control measures should be adopted where the self inspection should consist of the following: reading labels on the products, cleaning the utensils and equipment (cross-contamination control), washing hands before touching food, time-temperature control from start to finish of the food preparation cycle and adopting proper storage procedures.

SCAP

The format of a SCAP chart (see fig. 3) is very similar to the S.A.F.E. chart but its content addresses the three basic components of health care services, prevention (food safety), promotion (food selection or choices) and intervention (therapeutic food and clinical nutrition) in a self care practice format. There are four columns in the chart which are the activity areas, current responsibilities, assigned responsibilities and action analysis, which describes the specific requirements for achieving the targeted goal. Column I refers to the activity areas where this particular take-out restaurant has six full time food service operators functioning in five areas which require at least eight operators based on the food volume and number of sales of meals. The current responsibility describes the activities performed presently by the operators who record the starting point from which a targeted goal should be defined and the means to achieve it. At the present time, the current responsibilities are not customer health goal oriented. The assigned responsibility column attempts to include the data collected for the effective application of food safety, and the appropriate food choices for the customer's fitness and well-being. The action analysis column records the evaluation of the goal achieved by listing the customers ideas of what will make or break health.

Comparative Analysis

The basic objective of the three approaches, traditional inspection, HACCP and S.A.F.E., is to provide safe food to the customers and minimize the occurrence of food borne outbreaks. The inspection report form used in a traditional

SCAP Chart Take Out Chinese Restaurant

Activity Areas	Current Responsibility	Assigned Responsibility	Action Analysis
Customer Services Operator, Cashier	Takes food orders/ serves soda	Survey of customers health status a. questionnaire b. oral interview data collection	Customer population approximately 65% are male, 33-34% are women and 1% are children. About 5% reported to be MSG sensitive. Customer's comprehensive health profile is difficult to assess.
Food Service Management Operator, Owner/Manager	Supervision of workers hygienic practices. Evaluation of food handling methods. Supervision of the facility for acts of ventilation	Analysis of weak points and strong points of operational activities. Development of communication skills.	The ingredients effectiveness of fried rice are lost because the customer's demand of more cholesterol, fat, salt, etc. in the fried rice. The safety skills of the food handlers is extremely poor. Attention is mostly on the cooking details,not to health and well being
Menu Operator, Owner/Manager	Constant evaluation of sold menu items, food costs and safety factors	Menu analysis and modification related to data collection and personal choices	Fried rice accounts for approximately 70% of the items sold. Food safety risks factor in menu items exist. Modification of the ingredients in the menu is being made at the customers request.
Food Substances Operator, Helper #1	Storage of foods in walk-in cooler. Food handling of raw meat, fish, chicken, eggs and fresh produce.	SCAP guidelines and procedures. Expected to correct errors and faulty practices	Acute storage problem due to shortage of space. Disorganized and clutter problem also exist. High potentialities of cross contamination. Food handlers lack awareness, knowledge and skill to receive problems.
Operator, Helper #2	Storage of dry foods. Food handling of cooked foods. Cleaning of all equipment	Strict adherence to SCAP guidelines and procedures. Expected to correct errors and faulty practices	
Food Environment Operator, Cook #1	Preparation and cooking of vegetables. Careful handling of potentially hazardous foods and equipment	Applying safe food handling practices and techniques	Ineffective TT monitoring. Effective cooking (heat treatment) practices are very poor. Sanitation practices, and also especially poor hand washing practices
Operator, Cook #2	Periodically cleaning equipment and surfaces and food preparation activities as well	Preparation of food with effective heat treatment	

inspection "indicates *where* the food contamination potentialities are, HACCP audits *when* and *how* hazards occur and S.A.F.E. has the ability to obtain information for *what* has to be done to reduce the incidence of food borne illness."(12) SCAP is an outline of simple measures, procedures leading to solutions for the customers health. The traditional inspection focuses on demerit evaluation in which the safety of the food substance is observed megascopically by marking violations (demerit items). HACCP looks for any growth curve of pathogenic microorganisms to maintain the log phase throughout the flow process from receiving to serving. The central theme of S.A.F.E. is the understanding of the preparation cycle in relation to bacterial contamination and growth in a specific menu, and to improve the self inspection techniques for a quality product as well as to prevent foodborne illnesses. SCAP is a program to resolve the problems of faulty food handling practices, abuses, wastages, etc. through effective human factor management such as applying the "just in time" philosophy and "job in training" principles.

The take-out Chinese restaurant menu listed 125 items of which the largest sale item is fried rice with shrimp or pork. The customer food intake contains cholesterol and fat contents due to adding up of potentially hazardous foods (meat and fish) to the final cooking process where contamination of pathogen bacteria could occur. Besides bacterial contamination, food service managers should be aware of the fact that "the formation of meat mutagens measured according to Ames test is highly dependent on cooking time and temperature. Negligible mutagenicity is recorded at temperatures around 100 degrees Celsius such as boiling, microwave cooking, or the short-term frying, stews and casseroles. Pan frying, broiling and overbaking are the cooking methods that are most likely to produce mutagenicity. The formation of mutagenic activity increases with increasing temperature." (13, 14) The short term stir-fry cooking with bite size pieces of meat probably have a possibility of negligible mutagenic activity. The problem that this establishment is facing, is the limited storage space for the many food items on the menu which are occasionally or rarely used. The primary emphasis is on the preparation and cooking skills of the employees. The environmental cleanliness and safety emphasized in a routine inspection contributes to the awareness, of food handlers in a take-out restaurant, of the contamination factors which then helps in the recognition of where problems can occur. The specific flow chart in HACCP recognizes the contributory factors of contamination in the food chain process. The problems that arise in the restaurant due to imbalances, resulting from high volume production, takin place in limited time and space and the shortage of personnel required for a high quality end-product. The take-out restaurant food service workers engaged in the production of fried rice understood the S.A.F.E. procedures well and were willing to apply them because they were convinced that a S.A.F.E. survey looks for consumer satisfaction, liability reduction and the minimalization of human errors in the food preparation processes. In SCAP, the food service operational alogrithm, though incomplete, reveals that the ingredient effectiveness of fried rice is lost, from the health goals point of view, because the customers demand cholesterol, fat and salt in the food preparation for their gastronomic satisfaction. The coordination of all the activity areas of SCAP by management to minimize the errors in work performances could resolve problems in the sequence of procedural steps by understanding food-health related service issues and taking care of self care links in the food product consumption cycle of the restaurant.

Final Analysis

The optimum level for the efficient and safe operative tasks in a restaurant are targeted for maximum profit, but often is out of reach due to the shortcomings of operational management. This level of efficiency depends on two criteria which are the food service workers performance and the gross output, which go hand in hand. What causes the customers to get sick is something food service managers and operators cannot visualize. In this context, it should be emphasized that all aspects of any health care services should be coordinated in the best interests of the customer's health and well-being. The most challenging issue that a food service operator faces is that of time, when a multitude of duties are assigned to be finished in a short period of time and as a result of it things are done in a hurry. Therefore, food service workers often miss details or make errors in the completed job especially when things take time. All the preventive approaches for food safety such as the traditional inspection, HACCP and S.A.F.E. are very useful but they fail due to the compression of time and a shortage of workers when the job is needed most.

We have seen that all the approaches are valuable: traditional inspection, HACCP and S.A.F.E. have intrinsic values which can be used to identify disease prevention.

SCAP is more comprehensive because besides the application of food safety in preparation, it involves the customer who can make menu choices for better health and fitness.

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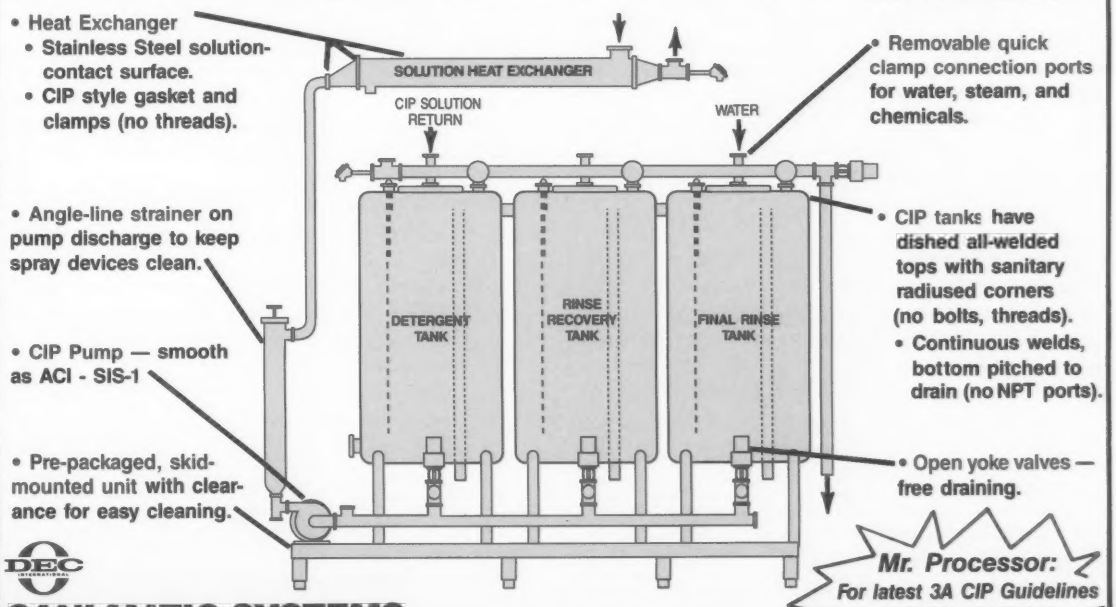
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Good Laboratory Practices - Food Microbiology Laboratories

Microbiology and Food Safety Committee of the National Food Processors Association[1,2]

The Microbiology and Food Safety Committee of the National Food Processors Association consists primarily of food microbiologists who have been or are involved in microbiological analyses in various laboratories. The committee has set forth guidelines for minimum acceptable practices for food microbiology laboratories in order to better evaluate both in-house and contract test laboratory practices. A checklist for laboratory units is appended.

Scope: These guidelines represent the minimum acceptable laboratory practices for routine food microbiological analyses. This document covers recommendations for these areas: Personnel, Facilities, Equipment, Operations, and Records.

Personnel

Supervision: The laboratory supervisor should have the proper education, training and experience with the performed analyses and associated biohazards.

Staff (including lab supervisor): Duties of each position should be documented in a job description. All staff should be qualified by adequate education, training and experience to perform their duties. A continuing education program to maintain competence in the field should be developed and documented for each individual.

Facilities

General: The laboratory should be suitable for conducting routine microbiological analyses of food products. The laboratory should be temperature-controlled. The laboratory should be designed to be easily cleaned, have adequate lighting, and have benchtops that are resistant to water, acids, alkalies, organic solvents and moderate heat. The design should also provide adequate containment of the worst case microbiological hazard to be encountered. There should exist separate or defined areas for the receipt, preparation/handling, storage of microbiological samples, as well as microbiological analyses. Sufficient work space should be available to carry out the work.

An autoclave should be available, preferably in the laboratory, for decontamination of laboratory waste.

Access to the laboratory, particularly to analytical and/or areas containing potential biohazards, should be limited to authorized personnel.

Animal Care Facilities, if present, should be operated according to the standards as specified for experimental animals. Federal, State and Local authorities may have jurisdiction and specific requirements for such facilities. Animals not involved in the work being performed are not permitted in the laboratory.

Laboratories with open windows should have the windows equipped with fly screens.

An insect and rodent control program should be in place.

Equipment

General: Equipment should be suitable for the purpose it is intended to serve. Equipment should be regularly inspected, cleaned and maintained.

Maintenance Program: For each piece of critical equipment, a log should be kept noting the instrument name and serial number, and the telephone number to call for service (i.e. instrument's manufacturer). For equipment not routinely inspected or maintained, or not used and calibrated daily, the log should also document:

1. Inspection
2. Cleaning
3. Scheduled maintenance
4. Non-routine repairs
5. Testing
6. Calibration.

Each entry should detail the function performed, by whom, and the date.

Equipment Manuals: Written instructions for the proper operation of the equipment (usually provided by the equipment manufacturer) should be readily available to the staff. The analyst should thoroughly understand the equipment operation to the extent determined by the supervisor.

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Operations

General: A written Quality Assurance program should be available to all personnel. This written program should include sections on the Biosafety Program, Equipment Maintenance Program, Microbiological Methods, Laboratory Control Programs, Stock Culture Maintenance, Sample Receipt and Handling, and Records.

Methodology: All microbiological methods used must be clearly written and current. Laboratory manuals and standard operating procedures should be available at all times in the immediate bench area. Methods should only be used for samples on which they were intended. The methods could originate from a number of sources:

1. Scientific Society Methods (AOAC, AACC, AOCS, APHA, etc.)
2. Accepted Regulatory Methods (FDA-BAM, USDA)
3. Methods published in a scientific journal
4. Methods received from other companies
5. Methods developed internally

Methods in categories 3, 4 and 5 are to be checked for reproducibility and accuracy in comparison with accepted methods where they exist. Methods in categories 1 and 2 should be sufficiently tested on the samples in question.

It is recommended that the laboratory routinely participate in an Inter-laboratory Check Sample program to verify the adequacy of methodology, technique and detection capability.

Procedures: All personnel should use accepted microbiological technique to promote accuracy, to prevent cross-contamination of samples, and to prevent personal contamination. All personnel should practice good sanitation and hygiene. Proper laboratory clothing should be worn, as appropriate for their duties. Gloves should be worn when working with infectious agents or toxins. Lab coats should not be worn outside of the laboratory facility or after contamination with pathogenic material.

A biosafety manual should be developed or adopted and made accessible to the staff. Personnel should be advised of special hazards and be required to read, understand and follow instructions related to those hazards. Policies and procedures should be established whereby only persons who have been advised of the potential hazard should be permitted to work with the materials potentially containing those hazards.

All reagents should be labelled and Material Safety Data Sheets (MSDS) should be available.

Mechanical pipetting devices should be used and mouth pipetting avoided. Mouth pipetting should be prohibited when working with hazardous materials (i.e. toxins, pathogens, etc.).

Staff should wash their hands with an antimicrobial hand soap after working with potentially contaminated lab materials and/or leaving the working area.

Laboratory Control Program: The following testing or inspection should be done at the stated frequency. The results of all tests should be kept in a bound log book, with each entry initialed and dated.

Water:

Bacteriological suitability test - yearly
Ref: Standard Methods for the Examination of Water and Wastewater
APC (<10,000/ml) - monthly
pH (5.5 to 7.5) - monthly
Conductivity (>0.2 megohms as resistivity or <0.5 microohms/cm at 25°C) - monthly
Free chlorine (zero) - monthly
Trace metals (Pb, Cd, Cr, Cu, Ni, Zn: <0.05 mg/L) - yearly

Media:

All media should be dated when received and when first used. Discard unopened media after exceeding the expiration date of the manufacturer or, if none given, after 2 years. Opened media should be discarded after 12 months or if any physical (i.e. caking of dehydrated media, drying of liquid/agar media) or functional (i.e. control plate doesn't work) deterioration of the media is observed. Note that some Federal, State and Local Lab Certification programs may require a shorter time period of acceptability of opened media (i.e. discard opened media after 6 months); the more stringent requirement should be used. Media should be stored as recommended by the manufacturer; if none is given, store media < 25°C.

The pH should be checked on all media when made. Keep an initialed log of media pH to provide documentation that the reading was made, as well as the result. Media should be dissolved and dispersed before sterilization. Agar media should be at the prescribed temperature when pouring.

Adequate procedures should be implemented to assure that a medium is performing as intended. Control plates (with positive and negative cultures) should be run each day a medium is used. An uninoculated control plate should also be incubated for each container of prepared media.

Biochemicals and Serologicals:

Date these chemicals as they are received and first used. Discard on expiration date. Store according to manufacturer's recommendation.

Temperature Control: All incubators, waterbaths and refrigerators should be equipped with known accurate thermometers, or appropriate automatic recording devices, which are graduated in tenths of a degree centigrade. Use of more than one thermometer in large incubators is appropriate to monitor potential temperature gradients.

Thermometers or recording devices should be checked daily and the results (operator-recorded reading or chart) kept in an initialed log book.

All thermometers and recording devices should be calibrated yearly using a thermometer certified by the National Bureau of Standards.

Equipment should perform within the manufacturer's stated tolerances. Temperatures should be adjusted, and the temperature range maintained, as appropriate for the user, or as recommended by authoritative sources.

Examples of typical temperature settings would include:

Incubators:	21°C, 25°C, 30°C, 35°C, 55°C with temperature ranges from ± 0.5°C to ± 1.0°C
Waterbaths:	Fecal coliforms 44.5°C ± 0.2°C or 45.5°C ± 0.2°C
	Media (tempering) 46° to 49°C
Refrigerator:	Media & micro supplies (1° to 4.4°C)
Freezer:	Samples and stock cultures -20°C to -70°C

Equipment Control

Autoclave

Each autoclave run should be recorded and include the date, time, load description, run duration and temperature. "Come-up time" should be as short as possible; excessive "come-up" should be corrected.

- Temperature chart changed daily (Autoclaves without temperature charts should have the time/temperature of each run properly documented.
- Each run checked for proper time/temperature
- Use of autoclave tape or indicator strip is recommended on each batch
- Biological control (spore strip) run weekly
- Proper functioning checked at least twice/year by a certified autoclave repairman

Automatic fillers (Filamatic)

Fill volumes should be checked at each filling and after autoclaving of dilution blanks. A discard date may be included with blanks at a time when evaporation may have significantly affected volume. Fill accuracy checked once per week or with each change, whichever comes first.

Balance

The balances and area around them are cleaned as needed to ensure accuracy of the balances. Accuracy checked monthly with certified weights, and serviced annually.

Biological Safety Cabinets

Should be used when procedures have a high potential for creating infectious aerosols, or when high concentrations of large volumes of infectious agents are used. Containment equipment and other personal protective devices should be as recommended for the procedures and organisms (See *Biosafety in Microbiological and Biomedical Laboratories*, 1st ed., HHS Publication no. (CDC) 84-8395, U.S. Government Printing Office, Washington, D.C., March 1984).

Dishwashing procedures

All items should be fully cleaned with no remaining detergent residue. Toxicity should be checked twice per year or after a change (lot or brand) in detergent. Method used to test for toxicity should be referenced (i.e. *Standard Methods for the Examination of Water and Wastewater*, 15th Edition, 1980, pp. 754 -756).

Hot air drying oven

Should be checked twice per year to verify achievement of proper temperature. If used for the sterilization of glassware, temperature should be continuously monitored. Verification of biological control (spore strip) should be run monthly.

Laminar Flow Hood

Should be checked twice per year to verify adequacy of airflow. Open air plates with general nutrient medium should be used to monitor sterility of environment when unit is operating. Hood should be operated using manufacturer's guidelines. HEPA filters should be replaced when airflow is restricted beyond tolerance or HEPA filter damage cannot guarantee sterility. Unit interior surfaces should be disinfected with sanitizer before and after use. Infectious agent work should not be done in a laminar flow hood, but should use the appropriate biological safety cabinet.

Microscope

Manufacturer's recommendation for the use and maintenance of the microscope should be followed. Care should be taken to prevent contamination of the microscope with the microbiological agents being examined.

Miscellaneous equipment and supplies

Culture plates, tubes, dilution bottles, pipettes, blenders, stomacher bags, WhirlPak bags, etc., should have sterility checked on each lot, and results recorded in log book with test method referenced. All should be of good laboratory quality.

pH meters

Slope calibrated with each use or daily, whichever is longer. Limit of acceptability on slope should be established. pH meter should be checked with both pH 4.01 and pH 7.00 solutions before each use, with temperature compensation noted, or using an automatic temperature compensator. Results kept in an initialed log book.

Work Areas: All work areas should be decontaminated with disinfectant every day before and after each use, and after any spill of viable material. The concentration and activity of disinfectant should be checked at specified intervals. Eating, drinking, smoking, gum chewing and applying cosmetics are not permitted in the work area. Each laboratory should contain a sink for handwashing.

Air testing and swabbing of preparation and plating areas should be conducted monthly to verify freedom from contamination. Sedimentation plates should be set out during daily plating.

Hazardous Waste: Any potentially infectious liquid or solid waste must be decontaminated before disposal. Proper biohazard warning signs should be posted on the access door to the laboratory. Use of biohazard symbols should be restricted to indicate biological hazards; indiscriminate use should be prohibited.

A Standard Operating Procedure for the handling of potentially hazardous or infectious waste should be documented and available to all laboratory personnel. All personnel should be adequately trained on the handling of this material. Written records documenting this training should be maintained.

Material or equipment contaminated with toxins (through normal use or spills) should be appropriately detoxified (e.g., botulinal toxin with 0.1N NaOH; aflatoxin with dilute bleach, etc.).

Stock Culture Maintenance: Procedures for the maintenance and containment of stock cultures should be documented. Records should be kept verifying the original source and the proper handling/transfer of stock cultures. All personnel handling stock cultures and responsible for maintenance should be adequately trained to handle such cultures and have good understanding of the nature of the cultures being handled/maintained.

Hazardous Culture Shipment: Shipment of hazardous cultures should follow all pertinent regulations. Generally, hazardous cultures must be adequately sealed to prevent leakage, and then enclosed within 2 additional hermetically sealed containers to prevent accidental leakage during handling and shipment.

Records

Samples: The following information should be recorded on all samples submitted for testing:

Description and Condition on receipt
Source
Quantity
Lot Number
Code
Date

Subsamples of the tested lots should be retained for 3 months, or other specified time period as appropriate, under appropriate storage conditions.

Data/Results: All data should be promptly recorded in ink in bound laboratory books. Any observations that would affect the credibility of the results should be recorded. All results should be dated on the date of entry and initialed by the person entering the data. Additionally, all recorded data should be reviewed, signed and dated by a person other than the person making the entries. Computer entry of results may be used in place of manual, logbook entry.

Record Retention: All records should be retained for a minimum of 6 months past the shelflife of the product. If shelflife is unknown, retain the records for a minimum of 2 years.

APPENDIX

GOOD LABORATORY PRACTICES - FOOD MICROBIOLOGY LABS CHECKLIST

	YES	NO*
I. Personnel		
A. Supervision		
1. Supervisor has the proper eduction to perform his/her tasks.		
2. Supervisor has adequate training for the position.		
3. Supervisor's experience is adequate for the position.		
B. Staff		
1. Job descriptions are documented for all positions.		
2. Staff members have the appropriate education, training and/or experience for their jobs.		
3. There is a continuing education program for the employees.		
II. Facilities		
A. General		
1. The laboratory is suitable for conducting routine microbiological testing.		
2. The facility has:		
a. defined areas for sample receipt, handling, and storage.		
b. sufficient space to carry out the work.		
c. adequate containment of microbiological hazards.		
d. an autoclave for decontamination of waste.		
e. an insect and rodent control program.		
f. laboratory access restricted to authorized personnel only.		
III. Equipment		
A. General		
1. The equipment is regularly inspected, cleaned and maintained.		
B. Maintenance Programs		
1. A log exists for each piece of critical equipment noting name, serial number, and telephone number for servicing.		
2. A log exists for equipment that is not routinely inspected or maintained, or not used and calibrated daily.		
C. Equipment Manuals		
1. The written instructions for equipment operation are available to the staff.		

*Provide explanations for "no" responses

GOOD LABORATORY PRACTICES - FOOD MICROBIOLOGY LABS CHECKLIST 2

	YES	NO*
IV. Operations		
A. General		
1. There is a written Quality Assurance program available to all personnel.		
2. The following sections are included in the QA program:		
a. Biosafety Program		
b. Equipment Maintenance		
c. Microbiological Methods		
d. Sample Receipt and Handling		
e. Record Keeping		
B. Methodology		
1. Microbiological methods are documented and available to staff.		
2. All methods originate from reliable sources (e.g., AOAC, FDA-BAM).		
3. If the methods originate from other sources, the methods have been tested for accuracy and precision.		
C. Procedures		
1. Personnel use good microbiological techniques to promote accuracy and prevent contamination.		
2. Good sanitation and hygiene practices are in evidence.		
3. Proper laboratory clothing is worn.		
4. A biosafety manual is available to the staff.		
5. Personnel working with specific hazards have been advised of the hazards.		
6. Personnel are instructed in the proper handling and disposal of hazardous materials.		
7. Potentially hazardous materials are not mouth pipetted.		
D. Laboratory Control Program		
1. There are bound laboratory books for the Lab Control Program.		
2. The following inspections or tests are performed at the stated frequency:		
a. Water		
i. Bacteriological suitability test and trace metals...yearly.		
ii. APC, pH, Conductivity, Free Chlorine...monthly.		
b. Media		
i. Dated when first received and when first used.		
ii. Unopened media are discarded when expired.		
iii. Opened media are discarded after 12 months or before if shown to have physical or functional defect.		

*Provide explanations for "no" responses

	YES	NO*
iv. The pH is run and documented on all media when made.		
v. Positive/negative controls are run each day a medium is used.		
c. Biochemicals and serologicals		
i. These are dated when received and first used.		
ii. Biochemicals and serologicals are properly stored.		
iii. Only "non-expired" chemicals and serologicals are used.		
E. Temperature Controls		
1. All incubators, waterbaths and refrigerators are equipped with known accurate thermometers or appropriate temperature recording devices (0.1°C graduated).		
2. The thermometers are checked daily and results recorded in a log book.		
3. Thermometers are calibrated yearly using a certified thermometer.		
F. Equipment Control		
1. Autoclave		
a. The temperature chart is changed daily.		
b. Each run is checked for proper temperature.		
c. A biological control is run weekly.		
d. Proper functioning is checked twice/year by a certified technician.		
2. Automatic Fillers		
a. Fill volumes are checked at each filling and after autoclaving.		
b. Blanks are dated (volume may be inaccurate - evaporation).		
3. Balance		
a. The balances and surrounding areas are clean.		
b. The balance accuracy is checked monthly with certified weights.		
c. The balance is serviced at least annually.		
4. Biological Safety Cabinet		
a. Biological safety cabinets, if present, are used for procedures creating infectious aerosols or high concentrations of infectious agents.		
5. Dishwashing Procedures		
a. All equipment is free of detergent residue.		
b. The toxicity-free status is checked twice per year or after change in detergent.		

*Provide explanations for "no" responses

	YES	NO*
6. Hot Air Drying Oven		
a. The oven is checked twice per year to verify temperature.		
b. If used for sterilization of glassware, the temperature is monitored.		
c. If used for sterilization, a biological control is run monthly.		
7. Laminar Flow Hood		
a. The hood is checked twice per year to verify adequacy of air flow.		
b. Open air plates are run during microbiological testing.		
c. The interior unit is disinfected before and after use.		
8. Microscope		
a. The microscope is in a clean, useable condition and regularly serviced.		
9. Miscellaneous equipment and supplies		
a. Sterility checks are run on culture plates, tubes, dilution bottles, pipettes, blenders, stomacher bags, WhirlPak bags, etc.		
b. Results of sterility checks are recorded in a log book.		
10. pH Meters		
a. The slope is calibrated on a daily basis.		
b. The pH meter is standardized with proper buffers before each use.		
c. The results of slope calibration are kept in a log book.		
G. Work Areas		
1. Work areas are disinfected every day before and after each use, and after a spill of a viable material.		
2. Drinking, eating, smoking, and applying cosmetics are not done in lab.		
3. The laboratory has a sink for handwashing.		
4. Air tests and/or swabs of preparation and plating areas are taken monthly to verify freedom from contamination.		
H. Hazardous Waste		
1. Infectious materials are decontaminated before disposal.		
2. Proper biohazard signs are posted on the access door of the laboratory.		
3. A Standard Operating Procedures document exist specifying the proper handling of potentially hazardous waste.		
4. Personnel are adequately trained on the handling and disposal of potentially hazardous waste.		

*Provide explanations for "no" responses

	YES	NO*
I. Stock Culture Maintenance		
1. Procedures for the maintenance of stock cultures are documented.		
2. Records are kept verifying the original source and proper handling and transfer of stock cultures.		
3. Personnel handling stock cultures are adequately trained for their work.		
V. Records		
A. Samples		
1. All samples submitted for testing have the following information recorded:		
a. Description of sample, and condition on receipt		
b. Source		
c. Quantity		
d. Lot Number		
e. Code		
f. Date		
2. Subsamples of the tested lots are held for 3 months (or another specified time) under appropriate conditions.		
B. Data/Results		
1. Data are entered in bound laboratory books, or on computer.		
2. All results are initialed by the analyst.		
3. Corrections are properly made (crossed out and initialed).		
4. The laboratory books are reviewed, signed and dated by a second party.		
C. Record Retention		
1. Records are retained for a minimum of 2 years.		

*Provide explanations for "no" responses

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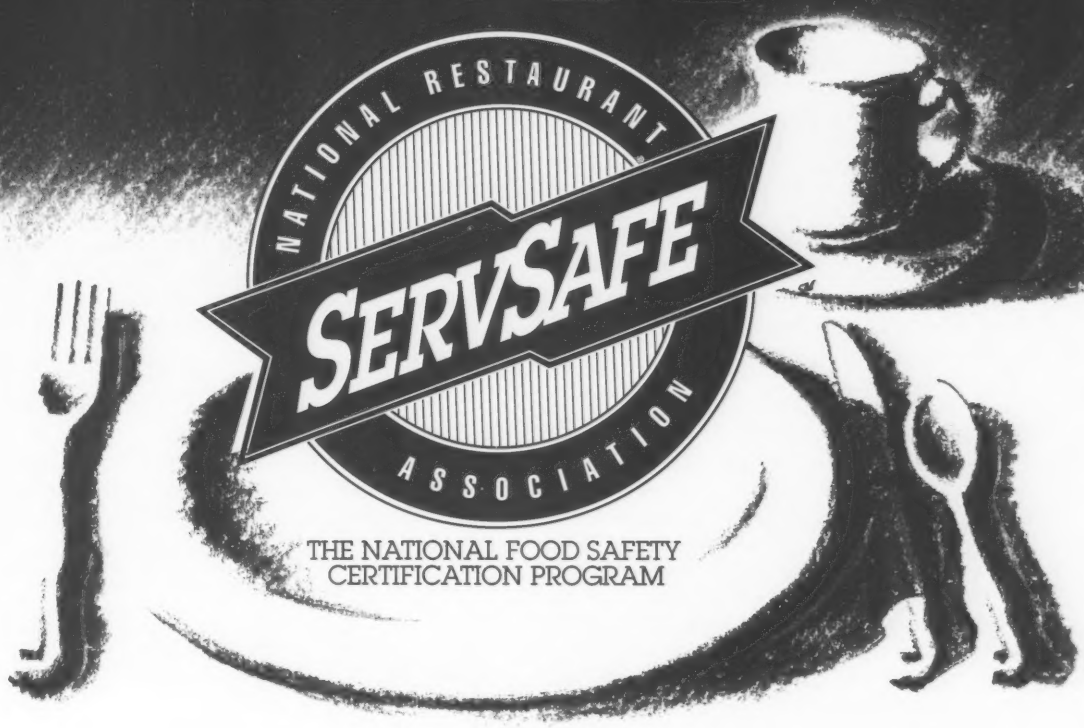

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The Use of Microwaves in Sterilization

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Abstract

A microwave oven was used to attempt sterilization in cultures of a sporulated and non-sporulated bacteria, a fungi and virus. Additionally experiments were performed to see if the lethality to microorganisms is due to microwave radiation per se or heat generated by microwave radiation. Four types of microorganisms were used: *Aspergillus nidulans strain 1*, *Escherichia coli K98*, *Bacillus subtilis* and *Bacteriophage T 4 r II A 196*. The microwave oven worked well with vegetative cells and the sterilization was due to the heat generated by microwaves.

Introduction

A microwave is an electromagnetic wave with a wavelength in the range 1 mm to 0.3 mm, (ie, between infrared radiation and radiowaves). Substances with high dielectric constants such as water absorb microwaves and convert the energy to heat. The molecules act as miniature dipoles and while oscillating around their axis in an attempt to go to the proper positive and negative poles, create intramolecular friction; this is manifested as a heating effect. At the microwave frequencies, e.g. 915 megacycles, the molecules oscillate back and forth 915 million times per second.

There has been considerable disagreement as to whether microwave radiation per se or heat generated by microwave radiation is the cause of lethality to microorganisms. There is a decrease in the survival of microorganisms exposed to microwave radiation once the thermal death point has been reached. (Culkin, et al ., 1975 ; Dreyfuss and Chipley, 1980).

Goldblith and Wang were unable to demonstrate per se microwave effects in their work concerning irradiation (2450 MHz) of *E. coli* and spores of *Bacillus subtilis*. Lechowich et al, concluded that detrimental effects of 2450 MHz irradiation on *Streptococcus faecalis* and *Sacharomyces cerevisiae* were due to the heat generated by the microwaves and not to any radiation effects. In a comparison study, Grecz et al., claimed that controlled temperature microwave heating of suspensions of *Clostridium sporogenes* PA 3679 spores was consistently more lethal than conventional heating.

The purpose of the present study was to try to establish a new method of sterilization using a microwave oven, and to compare this with conventional heating and conventional autoclave.

Materials and Methods

Microbial Growth

1. A culture of *Aspergillus nidulans* strain I was obtained from Birkbeck college U. of London, London, U.K. This culture was grown on Aspergillus Complete Media (ACM) which had the following composition weight/lt of H_2O, glucose 10 g, yeast extract 1 g, peptone 2 g, casamino acids 1.5 g, adenine 0.75 g, vitamin solution 10 ml, salt solution 20 ml, agar 15 g, cultured for 72 hours at 37°C. A conidial suspension was prepared from the cultures using tween 80 and glass beads, in order to determine the number of viable spores. These plates were incubated for 24 hours at 37°C and colonies counted with a colony counter.
2. A culture of *Escherichia coli* K98 was obtained from Dr. P. Oliver, Cambridge University, Cambridge U.K. This culture was grown on Nutrient Agar (NA) (OXOID), for 24 hours at 37°C. A bacterial suspension was prepared with Nutrient Broth (NB), (DIFCO), under the same conditions as above.
3. A culture of *Bacillus subtilis* was obtained from Dr. S.D. Martenelli, Birkbeck College, University of London, London, U.K. The culture and bacterial suspension were prepared as described for *E. coli*.
4. A *Bacteriophage* T4 for *E. coli* was obtained from Dr. S.D. Martenelli.

The viral suspension was obtained: Preabsorption of phage to bacteria was carried out by adding the appropriate dilution of a T4 to an exponentially growing culture. A small test was used and incubation took place at 37°C for 10-20 min. Then 2.5 ml. of H-TOP AGAR (at 45°C) were added to each tube and immediately poured over the surface of an H-agar plate. The agar was allowed to set and then incubated at 37°C face up for 8-10 hours. The top agar layer from each culture described above was scraped off with a bent glass spreading rod, and put into a large plastic sterile centrifuge tube. Two ml. of broth were added per plate. Then 5 drops of chloroform were added to each tube and shaken vigorously for 30 seconds. They were allowed to stand for several minutes.

The cell debris was spun down in a bench top centrifuge and the supernatants were saved. Two drops of chloroform were added and the tubes were stored in the cold at 4°C. When the viral suspension was obtained it was treated in the same way as described for *Aspergillus nidulans*. The dilu-

tions were made with L-broth. In the flask inoculum were 2 x 10^7 phage/ml.

Sterilization Techniques

1. Spores of *Aspergillus nidulans* were treated in the microwave oven at 56°C for 4', 60°C for 8', 77°C for 10', 82°C for 20', 85°C for 30' in order to measure the effect of such treatments on survival with a control without treatment.
2. The above experiments were compared with conventional heating in a water bath at the same temperature and time, to see if there was any "non-thermal effect". Survival curves were then drawn for both treatments.
3. After these experiments, cells of *Aspergillus nidulans, E. coli, B. subtilis* and *Bacteriophage T4* were treated with the maximum power 700 W, 2450 MHz specific microwave oven, (Model 8910-8950) maximum time: 30 minutes, temperature 85°C, to see if sterilization occurred. All suspensions were put in an ice container after each treatment.
4. These experiments were compared with conventional heat treatment (water bath) at the same temperature and time.
5. The experiments mentioned above were also compared with an autoclave at 121°C for 15 min.
6. Additionally, a fungal with an initial number of cells per ml. of 4 x 10^7 was used as control. The number of *E. coli* initially present were 4 x 10^7, for the phage 2 x 10^6 and *Bacillus subtilis* 3 x 10^7.
7. Survival percentage was determined by the plate count method.

Results and Discussion

When *Aspergillus nidulans* was treated with a microwave oven and conventional heat the percentage of survivors decreased when the time temperature exposure increased (Figure 1). Additionally it can be seen that only a thermal effect was produced and microwaves did not act on the bacteria per se (Figure 1).

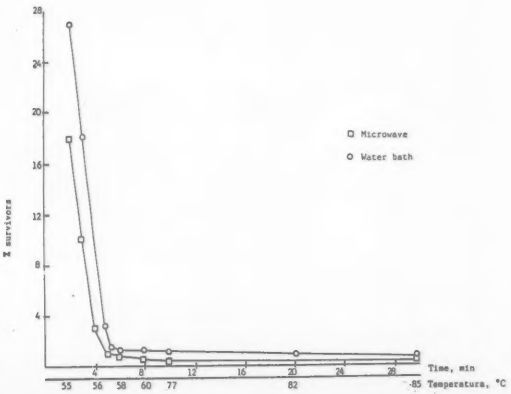

Figure 1. *Comparison of conventional heating and microwave oven treatment on* Aspergillus nidulans strain 1 *at different temperatures and time of exposure.*

At maximum time, power and temperature in microwave treatment with *Aspergillus nidulans* less than 0.1% survivors were obtained (Table 1). The same results were obtained for conventional heating (Figure 1). With respect to autoclave treatment no survivors were obtained.

As far as *E. coli* and *Bacteriophage* T4 0% survivors were obtained in all treatments (Table 1). On the contrary, depending on culture age, two different results were obtained:

a) No-survivors were found with *Escherichia coli, Bacillus subtilis*, and *Bacteriophage T4* fresh cultures, however, *Aspergillus nidulans* presented less than 0.1% survival rate.
b) *Bacillus subtilis* old culture was resistant to temperature with a 2.0% survival range (Table 1).

Table 1. Percentages of Survivors for the Different Microorganisms at 2450 MHz.

Microorganism	Time of Exposure Min	T (°C)	% of Survivors
Aspergillus nidulans	30	85	< 0.1
Escherichia coli	30	85	0.0
Bacillus subtilis (fresh)	30	85	0.0
Bacillus subtilis (old)	30	85	2.0
Bacteriophage T4	30	85	0.0

The effects of exposing *Aspergillus nidulans* to temperature ranging from 55°C to 85°C are shown in Figure 1. It is seen that the percentage of survivors in conventional heating (water bath) and the killing effect was due to heat and not to microwave effect as Lechowich et al. concluded. At temperatures higher than 56°C the percentage of survivors was low. When the *Aspergillus nidulans* were treated at 85°C during 30 min, only one colony (0.1% survival) was found (Fig. 1). It is not known if this result is due to thermoresistancy mutation.

In *E. coli, Bacteriophage* T4 and *Bacillus subtilis* fresh cultures, there is a strong indication that a perfect sterilization was reached with microwave oven set at 85°C for 30 min. However, with an old culture of *B. subtilis* of the same strain, some survivors remained (2% survival). This may be due to the presence of spores which are more temperature resistant.

Conclusions

The microwave oven method can be used as well as conventional heating, pasteurization, or tyndalization. Of all of these procedures, this method is fastest, but will not replace the autoclave method because of the remaining spores. This method also requires the microorganisms to be in solution. The controversy whether the microwaves per se

or the heat produced by microwaves have the killing effect in microorganisms is now clear.

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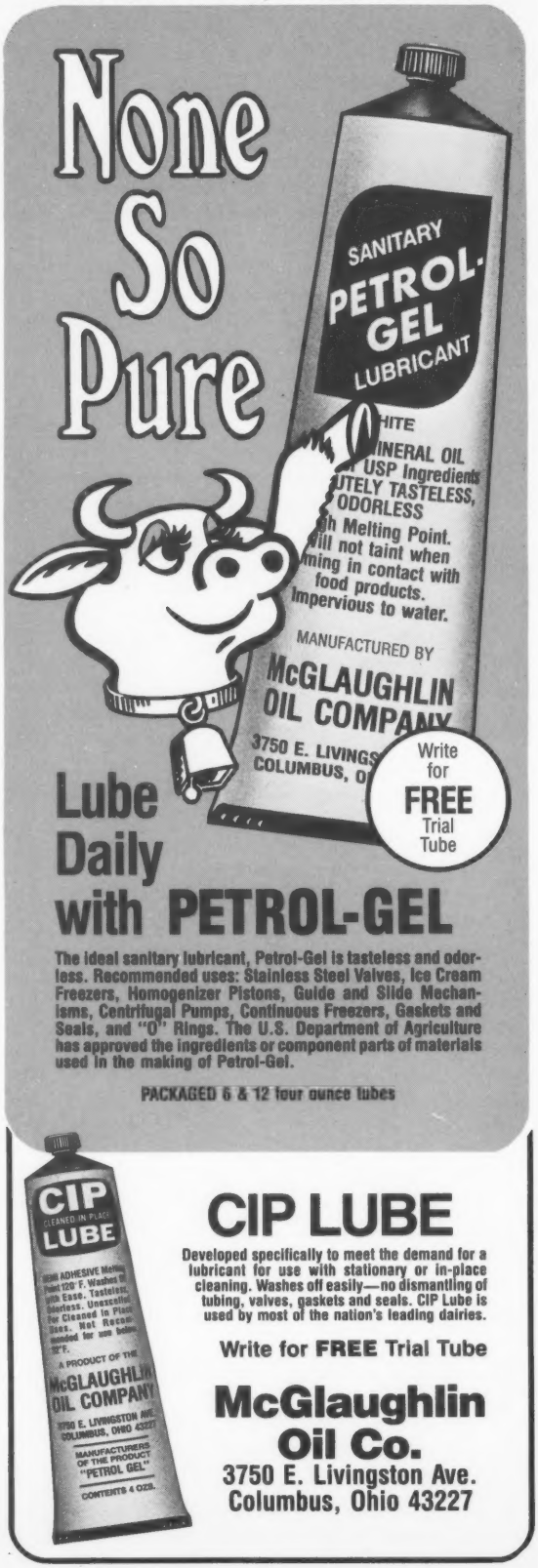
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Investigation of Bacterial Contamination of Street-vended Foods

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Abstract

The results of 290 samples of 16 kinds of street-vended foods that were collected for examination of aerobic bacterial plate count (total viable count), coliform, *salmonella*, *shigella*, and cholera or paracholera indicated that the street-vended foods were contaminated by bacteria to different extent. Of the 16 kinds of street-vended foods, the bacterial contamination of hot-dry noodles and meats stewed in soy sauce were most serious, in which total viable count were 66.7% and 70% over $1x10^5$/gram, respectively; Coliform (Most Probable Number) were 71% and 81.5% over $2.4x10^4$/100 gram respectively; discovery rate of *shigella* were 19% and 7.0% separately.

Street-vended food is a kind of cheap ready-to-eat food, made by street food vendors engaged in trade. Due to not being able to reach the hygiene standard during manufacture, package and sales, the bacteria contamination of street-vended foods were quite common and severe. The street-vended foods were investigated and examined in Yichang City and Puqi City (county level) from July to September in 1989 to assess their bacteria contamination.

Method

The focus of the investigation is on all kinds of local specialties sold by street food vendors in Yichang City and Puqi City (county level).

Field survey

Designing questionnaire, in which items include sanitary condition of environment where food is prepared and sold; setting to prevent contamination from flies, dust, and rotten food; safety of water supply and disinfection of tableware etc.

Examination of microorganism

Sampling street-vended foods with bacteria-free method and according to China National Standard Methods of Food Hygienic Analysis (microbiological section), examining aerobic bacteria count, coliform (Most Probable Number), *shigella*, *salmonella*, cholera or paracholera.

Results

The examination of aerobic bacteria count

The aerobic bacteria count of 290 samples of the 16 kinds of street-vended foods in Yichang City and Puqi City varied greatly, the highest was meats stewed in soy sauce and hot-dry noodles, in which geometric means were $2.2x10^5$/gram and $5.7x10^5$/gram, respectively; the samples on which aerobic bacteria count was superior to $1x10^5$/gram account for 70% and 66.7%, separately. The next was from cooled noodles and popsicle, in which geometric means were $1.6x10^4$/gram and $2.0x10^4$ /gram, respectively. It was found that the differences of aerobic bacteria count between stewed meats, hot-dry noodles, cooled noodles, popsicles and twelve other kinds of street-vended foods were statistically significant (Table 1).

Examination of coliform bacteria

Among the 16 kinds of street-vended foods, the geometric mean number of coliform (MPN) of meats stewed in soy sauce, cooled noodles were $1.2x10^4$/100gram and $1.1x10^4$/100gram respectively, the samples in which the coliform was superior to $2.4x10^4$/100gram account for 81.5% and 84.2%, respectively. The next was hot-dry noodles, cold dish and popsicle, the geometric means of coliform (MPN) on them were $6.5x10^3$/100gram, $5.2x10^3$/100gram and $3.0x10^3$/100gram. The results showed that the number of coliform on cooled food (food not heated or heated very short time before sale) was much higher than that on the cooked food (food heated sufficiently, before sale). Their difference was significant (Table 2).

The examination of pathogenic bacteria

Shigella was found in hot-dry noodles, cooled noodles, stewed meat, rice, ice-water and steamed stuffed bun. The discovery rate of *shigella* on hot-dry noodles was 19% (Table 3). But *salmonella*, cholera or paracholera were not found in any of the 290 samples of the 16 kinds of street-vended foods.

Discussion

290 samples of the 16 kinds of street-vended foods were investigated and examined for microorganism, in which

many samples of stewed meat, popsicle, cake, and ice-water were not in conformity with the National Microbiologic Standard. (Table 4).

Table 1. The results of examination of aerobic bacteria count on street-vended foods

Foods	sample number (portion)	range of examined results(/gram)	geometric mean (/gram)	SD	P	
hot-dry noodles	21	$1.3x10^3$-$5.0x10^7$	$5.7x10^5$	21.30	P1:2	>0.05
meats stewed in soy sauce	27	$2.4x10^3$-$2.9x10^6$	$2.2x10^5$	4.95	P1:3-16 P2:3-16	<0.01 <0.01
popsicle (ice-cream)	7	$2.1x10^3$-$1.0x10^6$	$2.0x10^4$	4.72	P3:4 P3:5-16	>0.05 <0.05
cold noodles	19	$3.6x10^2$-$2.7x10^5$	$1.6x10^4$	6.88	P4:5-16 P5:6-10	<0.05 >0.05
ice-water	20	$6.0x10^1$-$8.7x10^4$	3349	10.13	P5:11-16 P6:7-8	<0.05 >0.05
cake	11	$9.0x10^2$-$6.6x10^4$	8426	3.18	P6:9-16 P7:8-12	<0.05 >0.05
cold dish	19	$1.4x10^2$-$2.3x10^5$	3042	6.77	P7:13-15 P7:16 P8:9-12	<0.05 >0.05 >0.05
steamed stuffed bun (meat bun)	25	$6.0x10^1$-$6.1x10^4$	2598	8.23	P8:13-15	<0.05
noodles	15	$7.0x10^1$-$1.7x10^5$	747	11.74	P8:16 P9:10-16	>0.05 >0.05
cooked rice	24	$1.0x10^1$-$2.8x10^5$	794	13.60	P10:11-16	>0.05
steamed bread	10	$5.0x10^1$-$3.2x10^3$	621	8.20	P11:12-16	>0.05
cooked meat dish	18	$1.0x10^1$-$2.4x10^4$	615	6.00	P12:13-16	>0.05
boiled dumplings (ravioli)	11	$3.0x10^1$-$2.3x10^5$	320	10.30	P13:14-16	>0.05
cooked vegetable dish	18	$5.0x10^1$-$3.2x10^3$	393	3.18	P14:15-16	>0.05
fried or steamed dumplings (ravioli)	11	$2.0x10^1$-$8.7x10^2$	200	3.26	P15:16	>0.05
deep-fried twisted dough sticks	34	$3.0x10^1$-$4.7x10^4$	721	6.34		

Shigella was found in stewed meat and ice-water (Table 3). The results indicated that the four street-vended foods stated above were contaminated by bacteria severely. The other twelve kinds of foods, though there is no National Hygienic Criteria to compare to, Table 1 and Table 3 showed a very high aerobic bacteria count and coliform bacteria, and *shigella* was even found in hot-dry noodles, cooled noodles, steamed stuffed bun, and rice. These results proved that the other twelve kinds of foods were contaminated by bacteria gravely.

The place where street-vended foods were prepared and sold mainly are located in bus stop/station, dock, side-walks near recreation places with poor sanitary environment, and lack of essential hygienic setting. From the field survey of the street food vendors in Yichang City and Puqi City, those who had no fixed place to prepare and sell food, account for 26% and 11.5% respectively.

Table 2. The results of examination of coliform (MPN) on street-vended foods

Foods	sample number (portion)	range of examinated results(/100 gram)	geometric mean (/100 gram)	SD	P	
meats stewed in soy sauce	27	60-24000	$1.2x10^4$	4.76	P1:2-5	>0.05
cooled noodles	19	<3-24000	$1.1x10^4$	11.50	P1:6-16 P2:3-5	<0.01 >0.05
cold dish	19	90-24000	$5.2x10^3$	6.58	P2:6-16 P3:4-5 P3:6-16	<0.01 >0.05 <0.01
hot-dry noodles	21	<3-24000	$6.5x10^3$	23.20	P4:5	>0.05
popsicle	7	40-24000	$3.0x10^3$	17.98	P4:6-16 P5:6-16	<0.01 <0.01
rice	24	<3-24000	60	66.48	P6:7 P6:8-16	>0.05 <0.01
ice-water	20	<3-2400	48	19.20	P7:8-16	<0.01
steamed bread	10	<3-930	6.3	12.63	P8:9-14	>0.05
steamed stuffed bun (meat bun)	25	<3-2400	4.5	17.29	P9:10-14 P10:11-14	>0.05 >0.05
deep-fried twisted dough sticks	34	<3-2400	4.3	15.60		
cooked meat dish	18	<3-930	3.3	17.10	P11:12-14	>0.05
cooked vegetable dish	18	<3-2400	3.6	12.90	P12:13-14	>0.05
cake	11	<3-150	2.2	5.95	P13:14	>0.05
boiled dumplings (ravioli)	11	<3-430	1.7	6.20		
fried or steamed dumplings (ravioli)	11	<3	<3	0.0		
noodles (in water)	15	<3	<3	0.0		

Table 3. The results of examination of pathogenic bacteria on street-vended foods*

Foods	Sampling number (portion)	*Shigella***	
		number of positive samples (portion)	detected rate (percent)
hot-dry noodles	21	4	19.0
cooled noodles	19	2	10.5
stewed meat	27	2	7.4
cooked rice	24	1	4.2
ice-water	20	1	5.0
steamed stuffed bun	25	1	4.0

*Among the 290 samples *salmonella* and *cholera* or paracholera were not isolated.
***S. flexneri* mainly.

Table 4. The results of assessing stewed meat, popsicle, cake, ice-water by National Microbiological Standard (N.M.S.)

Foods	Examination number	Number not conformed to N.M.S.	Rate not conformed to N.M.S. (percent)
stewed meat	27	26	99
popsicle	7	6	86
cake	11	11	100
ice-water	20	19	95

These unfixed units had no safe drinking water supply, no setting preventing contamination from flies and dust, and no cleaned and disinfected tableware, so that it was impossible to assure the safety of street-vended foods. Among the examination of 34 tablewares for street-vended foods, the aerobic bacteria count and coliform on surface of tableware were $4.7x10^4$/ cm^2 and $1.4x10^2$/100 cm^2 on average separately. The detected rate of *shigella* on the surface of tableware was 4.7%. These poorly cleaned tableware certainly contaminated the street-vended foods directly.

Exposure of selling street-vended foods on the shelf was one of the important contaminating factors

Most street-vended foods were exposed in open air when selling, and therefore bacteria contamination from flies and dust could not be prevented. After being on food shelf for several hours, the aerobic bacteria count of deep-fried foods rose more than ten to one hundred times (Table 5).

Table 5. The relation between exposure time of selling deep-fried food on the shelf and contamination of bacteria

collected time	exposure time (minutes)	food	sampling number	aerobic bacteria count (geometric mean, /gram)
8 a.m.	<15	deep-fried twisted dough sticks and deep-fried pancake of rice	6	27
11 a.m.	120-180	deep-fried twisted dough sticks and deep-fried pancake of rice	6	377
14 p.m.	240-360	deep-fried twisted dough sticks and deep-fried pancake of rice	6	3617

The cooled food or the food heated insufficiently before sale were contaminated most severely among the 16 kinds of street-vended foods such as stewed meat, hot-dry noodles, cooled noodles, popsicle, cold dish etc. These results may be related to inadequate operation of sellers and poorly cleaned tableware or utensils.

Conclusion

This paper investigated 16 kinds of street-vended foods in Yichang City and Puqi City. The results indicated that the street-vended foods were contaminated by bacteria to different degree and the foods contaminated most severely was cooled food. To further promote the management and inspection of street-vended foods is very important in preventing foodborne disease.

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The Yogurt Story - Past, Present and Future Part VIII

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(Part VII of The Yogurt Story - Past, Present and Future appeared in the October, 1991, issue of Dairy, Food and Environmental Sanitation, pages 583-585)

Frozen Yogurt

Introduction

Anyone visiting a grocery store these days is confronted with a plethora of frozen yogurt products in all shapes and sizes. There are hard frozen yogurts in different flavors in pint, quart and half-gallon sizes in rectangular cartons as well as cylindrical containers. Additionally, one can find frozen yogurt bars, frozen yogurt sandwiched in-between cookies, and even frozen yogurt popsicles. Of course, all these products have low-fat and fat-free varieties. That is not all. To confound the picture, some of these products do contain some yogurt, some have a resemblance of yogurt, and some none at all. But all of these products vie for the label *frozen yogurt*. Are there some frozen dairy puddings masquerading as frozen yogurt in the marketplace? Food editors in national periodicals have lately highlighted this issue on the authenticity of frozen yogurt products (2,8,11).

Need for Standards

To dispel the current confusion and adhere to the concept of "truth in labeling," it is necessary to have well-defined national standards that will be applicable for inter-state commerce. The need for such standards is overdue. The regulatory agencies are keenly aware of this. In May 1991, the Food and Drug Administration issued advance notice of proposed rule making on standards for different categories of frozen yogurt, in the *Federal Register* (5). Currently there are two proposals awaiting public comment. One is from the National Yogurt Association (NYA) and the other from the International Ice Cream Association (IICA).

To understand differences of opinion between various groups keen on establishing credible standards, it is helpful to put the whole issue in proper perspective. Certain observers contend that a product to be called "yogurt" should have the essential attributes of yogurt. The characteristic attribute of yogurt is its fermentation by rod-coccus starter resulting in the increase in titratable acidity of the dairy mix. The distinction is not merely titratable acidity but significant *developed acidity*. That means that the end-product contains significant numbers of the rod *and* coccus cultures as a result of their symbiotic growth as well as a reasonable amount of their metabolic and cellular by-products. These observers cite that these essential characteristics indeed contribute to the health-promoting properties of yogurt, which the dairy industry should propagate among consumers. Well-informed consumers are aware of this. Yogurt has indeed come to be a force in the market because it is perceived as a wholesome, nutritious and healthful product. The low-fat and fat-free varieties have helped this image considerably. Many workers in the industry and the academia (1,8,9) believe that this positive impression among consumers should be preserved by extending the accepted attributes of yogurt to all products that bear the label *yogurt*. The consensus among this group is that although the total attributes of yogurt would not be compatible for the flavors desired in frozen yogurt, which is offered as an alternate frozen dairy dessert, frozen yogurt varieties should contain at least the *acceptable amounts of these characteristics* that are technologically and organoleptically feasible in their production. Such an "acceptable amount" would ensure the presence of the distinctive flora, metabolic and cellular products of fermentation in quantities that would partially qualify for the label yogurt. Such an approach would preserve the integrity of the name yogurt in the competitive marketplace.

The second opinion centers around the concept that frozen yogurts are special products distinct from regular yogurt - "frozen yogurts are marketed and perceived by consumers as a separate and distinct category of food that shares the essential characteristics of yogurt but that is offered and consumed in frozen form and has a unique taste and texture" (5). The point of divergence between the first opinion and the second relates to the extent to which frozen yogurt differs from regular yogurt. Some in the frozen yogurt industry feel that the flavor profile needed in frozen yogurt varieties would not be compatible with including "full or partial profile of regular yogurt." Additionally, they cite the need for flexibility in using certain "functional ingredients" such as fat substitutes, and processing variations such as post-(heat)-processing addition of yogurt culture to the mix just before freezing in the manufacture of the "specialized product" currently called "frozen yogurt" (1,5).

The two viewpoints discussed here to a large extent represent the stands taken by NYA and IICA. Hence, it may be useful to review their proposals. The points enunciated by the NYA are as follows:

1. All or part of the frozen yogurt mix must be inoculated with the characterizing yogurt bacteria and subsequently

fermented to ensure measurable conversion of dairy constituents. Addition of yogurt cultures without the opportunity for fermentation is not acceptable because the resulting product is not yogurt.

2. No chemical preservatives or other forms of preservation, other than refrigeration, be allowed for frozen yogurts. Further, the current standard of identity for refrigerated yogurt should be amended to prohibit any heat treatment after fermentation.
3. Direct addition of food grade acids or other acidogens for the purpose of raising the titratable acidity of the frozen yogurt mix to comply with the prescribed minimum be prohibited.
4. The presence of D(-) and L(+) forms of lactic acid should be considered to be a measure of reasonable fermentation.
5. The standard for frozen yogurt should provide that the number of viable yogurt organisms present at the time of manufacture and before the addition of any bulky flavoring ingredients must be at least 10^7 per gram as enumerated by the standard IDF procedure.
6. The standard should provide that the culture shall be active to the end of the stated shelf life of the product as determined by a specified activity test.
7. There should be specified requirements for titratable acidity, fat and solids-not-fat contents, minimum weight per gallon, and for the addition of vitamins A and D.

The foregoing points were mentioned in the comments filed by the NYA to the Food and Drug Administration (10). The requirements listed by the NYA largely applies to regular yogurt and to a great extent protects the integrity of the label *yogurt* in frozen yogurt varieties. Present flavoring and freezing technology for frozen yogurt could accommodate these requirements.

The proposals forwarded by IICA to a great extent parallel the points put forth by the NYA. The IICA proposals would require that all frozen yogurt products undergo bacterial fermentation with recognized yogurt bacteria, and that no heat treatment be allowed after culturing so that the products will contain live bacteria and "characteristics of bacterial fermentation that are appropriately associated with yogurts." According to their recommendations, direct addition of food grade acids or other acidogens to increase the titratable acidity of the frozen yogurt mix should be prohibited. Also, no chemical preservation treatment or other processes other than refrigeration could be used. The foregoing requirements agree with the specifications listed by NYA. The major area of disagreement relates to the titratable acidity value needed in the final mix as a result of fermentation. The NYA has suggested a titratable acidity of 0.5%. The IICA maintains that a T.A. of 0.5% is too high. Instead they have proposed a value of 0.3% in general, and in specific cases less than 0.3% if the initial T.A. of the uncultured mix was less than 0.15%. The rationale offered by the IICA for the lower T.A. is that normally the uncultured frozen mix would have a T.A. of 0.15% and a pick up of another 0.15% (to give a final T.A. of 0.3%) "is recognized by the industry as the level at which fermentation or culturing becomes identifiable *as having been initiated*" (5).

The normal T.A. of fresh milk ranges from 0.13 - 0.16% expressed as lactic acid. As the solids level is increased by the addition of non-fat milk powder in yogurt mixes, the initial acidity increases. So, depending upon the solids fortification, the acidity of the heat-treated mix may range from a low of 0.15 to a high of 0.18%. A titratable acidity requirement of 0.3% in the final mix would thus represent a pick up of 0.12 - 0.15%. This increase in acidity as the IICA claims represents a stage "at which fermentation or culturing becomes identifiable as having been initiated." In yogurt fermentation, the early stages are almost totally dominated by *Streptococcus thermophilus*. The initial acidity is to a large extent contributed by the coccus. There is very little growth or increase in the numbers of *Lactobacillus bulgaricus*. Because of this, the numbers of the rod are very low (not anything more than what was added as starter) during early stages of fermentation. Therefore, at the stage that could be identified as "initiation of fermentation or culturing," there will hardly be any rods in the mix or any of their cellular or metabolic by-products. The acidity requirement of 0.5% in the mix would represent a pick up of 0.32 - 0.35% which would need a fair amount of fermentation, at which stage some *measurable* amount of rod growth and accumulation of their by-products could be detected. The distinguishing features of yogurt include the presence of *appreciable* numbers of coccus *and* the rod, and their by-products. The requirement of 0.3% or less thus would not satisfy the stipulation "that all frozen yogurts contain the essential bacteria (in sufficient numbers) and characteristics of bacterial fermentation that are appropriately associated with yogurts."

If a *sufficient* portion of the frozen yogurt mix were cultured with yogurt starter to completion as in regular yogurt, and proportionately mixed with uncultured mix to arrive at a desired acidity, there will be enough numbers of both the rod and the coccus and detectable amounts of their cellular and metabolic by-products. Frozen yogurt made from such a mix would come closer to maintaining the integrity of the label yogurt. In the final analysis, whatever is decided on this vexing question, it is important that consumer credibility and confidence are preserved so that the dairy industry could carefully nurture this "goose that lays the golden eggs" (1).

Manufacture of Frozen Yogurt

Manufacturing procedures for frozen yogurts vary so much that it is difficult to provide a standardized procedure that could be used with suitable modifications to suit any specific requirement. It would, however, be useful to discuss this in the context of the evolution of the product that is today offered as frozen yogurt. Frozen yogurt actually had its birth pangs in the latter part of 70's. In one of the earliest papers by Kosikowski entitled *The Evolution and Technology of Frozen Yogurt* (7), he states "Technically, frozen yogurt is yogurt or flavored yogurt which is frozen in ice cream freezers with the introduction of air to give about a 50% overrun." According to him, unlike regular yogurt formulation which contains fluid milk and added milk-solids-not-fat, frozen yogurt mixes may contain more sugar than what is used in flavored yogurt, plus food grade acids like citric. The

sugars added may consist of sucrose and corn syrup solids to the tune of 7 to 15%. Additional sugar could also come from fruit preparations. He provided two sample formulations in that article, one with a higher protein but a lower level of carbohydrate and the second one with a lower amount of protein and a higher content of sugars. The formulations consisted of the following:

Components	MIX 1	MIX 2
Cream 10% Fat	131.7	147.2
Skim Milk	526.5	460.1
Skim Powder	36.0	6.1
Stabilizer	4.0	4.0
Sucrose	72.0	110.4
Corn Syrup Solids	--	42.2
	770.2	770.0
Yogurt Starter[a]	28.8	30.6
Fruit Preserves[b]	201.0	199.4
Total	1000.0	1000.0

All values given are in pounds. [a]Added after blending, pasteurizing and cooling. [b]Added after incubation of inoculated mix and cooling.

The overall process consists of blending the ingredients well and pasteurizing the mix at 170°-180°F for 30 min. followed by homogenization at 1700 psi. single-stage while hot. The mix is then cooled to 108°F, and inoculated with 3 - 4% of an active yogurt starter. The inoculated mix is incubated at the set temperature for 3-4 hr., then rapidly cooled to 40°F and flavors are added, and frozen. It is interesting to note that Dr. Kosikowski had addressed in that paper all the issues that are currently being discussed in developing credible standards for frozen yogurt.

Another early publication on the manufacture of frozen and soft-serve yogurt is that of Chandan (3). Dr. Chandan has discussed some of the marketing considerations in addition to the manufacturing of frozen yogurt. According to Chandan, most mixes contain 1.5 to 2.0% milk fat, 13 to 15% nonfat milk solids, gelatin (stabilizer) 0.15 to 2.0% (250 Bloom), 7 to 10% cane sugar, 4 to 5% corn syrup solids (24 to 26 DE) or 3 to 5% if DE equals 36. The total solids content of such a mixture will range from 24.6 to 32.2%. The processing steps involved are as follows:

1. Half the amount of sucrose, gelatin and nonfat dry milk are added to the standardized fluid milk using a powder horn and thoroughly blended. Half the amount of sucrose is used at this stage so that the yogurt fermentation is not retarded because of high sugar concentration.
2. The blended mix is pasteurized at 190°F for 40 min. or 195°F for 20 min.
3. The hot mix is cooled to 135° to 145°F and homogenized at 1500 psi. at the first stage and 500 psi. at the second stage.
4. The mix is then cooled to 111°F, transferred to an incubation tank and an active yogurt starter is added. If bulk starter is used a 2% inoculum is adequate for long set (usually overnight) or 5% for the short set method (usually 3.5 to 4.0 hr).
5. After mixing the inoculum, the tank is held at the setting temperature undisturbed until pH reaches 3.9. When this pH value is attained, the curd is broken with simultaneous cooling to 71° to 75°F.
6. The cooled yogurt is passed through a homogenizer without any pressure to smoothen and texturize the product.
7. Fruit is added at this stage at 15 to 20% level plus the remaining amount of sweetener in the form of a pasteurized solution. The sweetened, flavored product is blended to uniformity.
8. The mix could then be frozen with an overrun of 50 to 60% for hard pack. For soft-serve, freeze at 18° to 19°F.

It should be emphasized here that the production method detailed by Chandan involves complete fermentation of the initial mix, which is then followed by the addition of sweeteners and flavors. The product would thus have the tartness embellished with adequate amount of sweetness and flavors that are accentuated by the tartness.

Collins (4) in one of the early papers on frozen yogurt, provided the following formula for the mix: Butterfat - 1.5 to 2.5%; Non-fat milk solids - 10 to 12%; Cane sugar - 8 to 10%; Corn syrup solids - 9 to 11%; and Stabilizer- 0.2 to 1.0%. This author also recommended that yogurt portion of the mix should be prepared and cultured first. Sugar, stabilizer, water etc., should be blended separately, pasteurized and cooled to 80° to 90°F and then mixed in with the yogurt portion. The blended mixture is flavored and frozen. In this procedure also complete fermentation of the yogurt portion is recommended.

The alpha-Hoyer division of the alpha-Laval Company presented a detailed description for industrial production of frozen yogurt at the American Cultured Dairy Products Institute Conference held in 1977 (16). In that paper, several useful pointers are given. The presentation is addressed more towards overcoming problems associated with freezing mixes having a relatively higher acidity. The major problems encountered in using mixes with higher acidity according to the report (16) are stability and oxidation. During freezing of mixes with higher acidities, whipping air into the product to obtain overrun resulted in oxidative changes during storage of frozen yogurt. To avoid that, nitrogen gas could be used. Also, the outlet temperature from the freezer need to be maintained at a lower point (21°F) for a more acid mix because lactic acid lowers the freezing point of mix.

Emulsifier/stabilizer selection for yogurt mixes should be carefully made because denatured protein (acid precipitated protein) does not have the same whippability and foam stability as regular ice-cream mixes. According to that report most vegetable stabilizers form a "gritty structure which results in syneresis." The paper warned that mere substitution of ice-cream stabilizers for frozen yogurt was not advisable.

Tharp, in two papers appearing in 1978 and 1980, summarized various practices used in the industry at that period in manufacturing frozen yogurt (13,14). These publications should be consulted for details on mix compositions and processing variables. Similar information could also be found in the paper by Grosser (6).

The heydays of early versions of frozen yogurt lasted from about 1976 to early 1980's. Then for all practical purposes, there was a lull in their widespread distribution. What caused the sudden disappearance of a product that had the potential of capturing the fancy of the consumers? No definitive answers could be given for that trend. According to Ann Meyer (8), some experts claimed that ".... tart flavor was at least partially responsible for the downfall of the first commercial frozen yogurts introduced in early 1970s." Additionally it was felt that the product was either gummy or icy and did not taste like ice cream. The product, however, had greater numbers of viable yogurt bacteria. That did not mean that a widely acceptable product could not have been made using a fully fermented mix. In the same report, Ann Meyer has quoted Karl Kepner of the University of Florida to confirm the foregoing statement...."Most firms put the product out there, without designing a marketing program with it. They anticipated just getting it out there was enough." To this it may be added that the manufacturers failed to do their homework as far as research and development was concerned in solving some of the objections raised, by the proper choice of stabilizer systems, suitable sweetener combinations, and compatible flavorings. Possibly the pricing of the product in relation to ice cream was higher. The most important factor, however, was probably the timing. American consumers were not as conscious as they are today about fat, cholesterol, and "healthy" foods containing desirable lactic acid bacteria. There is also more emphasis on nutritional foods today. Again to quote Ann Meyer (8) "Kepner has noticed a difference in the second crop of frozen yogurts. Consumers like the products' sweeter taste and creamier consistency. And companies are supporting the products with promotions that *hype the nutritional benefits*." (The emphasis in the quote is mine).

Frozen Yogurt Scene Today

Looking at the widespread distribution and immense popularity of frozen yogurt among consumers young and old alike, we can say frozen yogurt has really come of age. What is probably needed is an identity of its own. This would come about once standards are adopted. Currently, frozen yogurt products fancy themselves as "ice cream clones!" Tieszen and Baer (15) did a survey of commercial frozen yogurts sold in retail stores in Brookings and Sioux Falls, S.D. and Minneapolis, MN. in 1988. They examined the samples for protein content, total solids and fat, ash content, freezing point, pH and titratable acidity. Further they also analyzed them for microbial content by Standard Plate Count, Coliform Count, and Direct Microscopic Count. The last mentioned test allowed them to estimate the presence of yogurt culture components. Frozen yogurt samples they obtained were vanilla, chocolate, and strawberry. Their results showed that the fat content of samples varied from 1.69 to 5.94%. Protein ranged from 1.61 to 4.19%. The values for total solids and ash were highly variable. The T.S. ranged from a low of 28.83% to a high of 37.6%. Ash fell between 0.7 to 1.06%. Freezing point, which is a reflection of dissolved solids especially the sugars, varied from a low of -4.36°C to a high of -2.13°C. The pH of vanilla varied from 6.37 to 7.10; and that of chocolate ranged from 6.36 to 7.10. Correspondingly, the titratable acidity was between 0.12 to 0.22% for vanilla and for chocolate between 0.14 to 0.24%. The pH of strawberry frozen yogurt was lower (4.37 to 5.70), which the authors pointed out as being contributed by the strawberry (T.A. varied from 0.37 to 0.87%). The microbiological analysis showed that the products had good sanitary standards, and most of them had live yogurt bacteria as revealed by specific plate counts. The DMC tests also showed the presence of both the coccus and rod. Their conclusion was that the composition of market samples of frozen yogurt was highly variable. And, from the acidity and pH values obtained, vanilla and chocolate flavored varieties had little or no developed acidity; and, in strawberry varieties if the acidity contributed by the fruit is discounted the probable extent of fermentation of the total or partial mix would be marginal. The survey results obtained by the South Dakota researchers (15) largely reflect the common variations in manufacturing practices which are as follows:

* Fermenting the yogurt base to a low acidity and freezing the low acid mix.
* Fermenting a portion of the mix and combining with the rest of the mix such that the acidity in the final mix is low.
* Making up a suitable mix, pasteurize, cool and add yogurt starter culture concentrate and immediately freeze.

In all the procedures listed the flavor is added before freezing. In all of the processes listed above although there may be "sufficient numbers" - 10^4 to 10^5 yogurt bacteria/ml - of starter organisms, the product would have undergone little or no fermentation.

Some of the reasons given for the low acid products are: low acid allows the use of flavors such as chocolate, coffee etc., low acid products do not exhibit a "curdy melt," low acid products are sweeter like ice cream which the consumers prefer. Research to overcome these objections is necessary. These problems are not insurmountable. A recent study of the composition and microbiological quality of commercial soft serve frozen yogurt sold around Gainesville, FL area by Schmidt and co-workers showed a wide variation in their composition and microbial content (12). In this study also a wide variation in pH and T.A. values were noted. The pH values ranged from 6.1 to 7.1 and the acidity values ranged from 0.18 to 0.42%. These readings reveal that very little, if any, developed acidity was present in the samples.

An example of the formulation and processing that could be used to produce a frozen yogurt product comparable to what is available in the market is given below:

Base		Yogurt Mix	
Cream 40%	4.57	Skim Milk 0.2%	96.57
Milk 3.25%	66.77	NFDM	3.43
NFDM	5.99		
Cane Sugar	14.70		100.00
Corn Sweetener (80%)	7.50		
Stabilizer	0.23		
Emulsifier	0.24		
	100.00		

Process the base mix. Determine the T.A. of the mix. Heat-treat the yogurt mix, cool to setting temperature, and culture until a predetermined T.A. Chill. The T.A. of the yogurt mix is based on the blend ratio used and the acidity desired in the final freezing mix. Suppose a blend of base mix: yogurt of 85:15 were to be used such that the acidity of the freezing mix is 0.33% and assuming that the acidity of the base mix equals 0.19% the calculations are made as follows:

$$\frac{\text{Desired Final Acidity (0.33) - Acidity of Base Mix (0.19)}}{\text{Proportion of Yogurt Desired (15)}} \times 100$$

which is equal to 0.93. The acidity of the yogurt mix should be 0.93. The blended mix should be frozen with an overrun of 80 to 100% at a draw temperature of 22° to 23°F. Flavor is blended in before freezing. Variations of this procedure could be used.

What of the Future?

Looking at the phenomenal growth of frozen yogurt products in the past couple of years, there is likely to be increasing sales. The dairy industry has been in the forefront in providing the American consumer with safe, wholesome, nutritious, well-defined products. If this credo of supplying the consumers with top quality products conforming to definite standards of identity is adhered to, with full commitment, the future of all dairy products including frozen yogurt is bright. And, frozen yogurt may be the brightest star in the dairy firmament.

Acknowledgments

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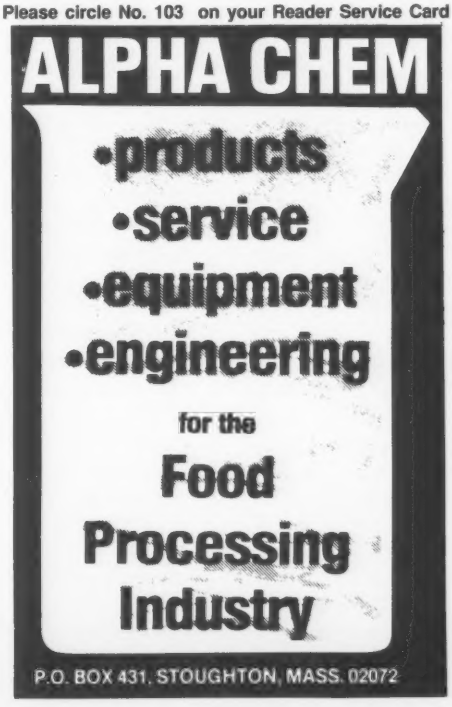

News

ISSC Recommends Consumer Message on Raw Shellfish

The Interstate Shellfish Sanitation Conference (ISSC), at their annual meeting in mid-August in Ft. Lauderdale, FL, recommended to all states an expanded consumer information initiative to inform immuno-compromised individuals of the health risks associated with the consumption of raw molluscan shellfish containing the bacterium *Vibrio vulnificus*.

The ISSC is comprised of state health regulatory officials, federal agencies, the shellfish industry, and academic representatives and is the principal body that develops molluscan shellfish sanitation guidelines for incorporation into the National Shellfish Sanitation Program (NSSP) which is administered by the Food and Drug Administration (FDA).

According to Ken Moore, Chairman of the ISSC, "this initiative will provide accurate information concerning the safety of molluscan shellfish and advise specific individuals with certain pre-existing medical conditions not to consume these products raw." He also stated that "by endorsing this new initiative the ISSC, shellfish regulatory officials, and the shellfish industry have taken an aggressive and responsible step toward reducing incidence of illness from *Vibrio vulnificus*."

As a part of the expanded consumer information initiative, the ISSC also approved the development of a comprehensive consumer education program targeted toward allied health professionals. According to Ken Moore, "dieticians, nurses, internal medicine physicians and support staff at alcoholic prevention centers have direct and daily contact with those individuals who are at-risk from eating raw molluscan shellfish. These health professionals should deliver the health message to those consumers who are at-risk."

The education effort is expected to be implemented in the autumn of 1991 and will be part of a comprehensive program which the ISSC and FDA will develop to address the *Vibrio vulnificus* problem.

The Conference also adopted a decision-making procedure to address disease causing organisms which appear in molluscan shellfish. The procedure will ensure rapid assessment of growing areas which may be implicated when incidence of illness occurs. This procedure may assist in identifying harvest areas which have potential for causing illness.

The National Advisory Committee on Microbiological Criteria in Foods presented time/temperature control recommendations for proper harvesting, handling and distribution of molluscan shellfish which will be reviewed by the ISSC for possible inclusion into the NSSP.

A new Aquaculture Section was adopted by the General Assembly and the Conference will recommend that the 1991 revision of the National Shellfish Sanitation Program contain, for the first time, specific performance requirements for aquaculture operations.

International Dairy Foods Association Labeling Workshops

There are three issues that will have significant impact on packaged dairy products in the next few years -- Labeling! Labeling! and Labeling!

When Congress passed the Nutrition Labeling and Education Act of 1990 (NLEA) it changed the entire spectrum of labeling and packaging food products. Managing this change will create a formidable challenge for every dairy foods company. These changes will impact every facet of your business -- from regulatory compliance to advertising and promotion and product formulations.

FDA has just published (November 8, 1991 *Federal Register*) approximately twenty proposed regulations to implement the NLEA. New rules about mandatory nutrition labeling; use of product descriptors such as "light" and "free"; ingredient labeling; cholesterol and fat descriptors; and health claim messages are just a few of the many areas that will require label changes. You will have to make decisions on brand names, positioning of products in the marketplace, and packaging designs that will affect your entire operation. How will these decisions be made? When will you be required to change your label? What are the new rules? These are just a few examples of what you will need to consider.

That's why we are conducting three national Labeling Workshops in the beginning of 1992. These preliminary workshops will clear up much of the confusion and allow companies to begin planning for the changes. The workshhops will discuss the latest information and provide you with Washington "insider" insight into the proposed regulations. Although the regulations are not final, there are a number of things you need to do *now* to be ready when the final regulations are issued.

Who should attend? If you received this information, probably you! Just about anybody who has involvement with how products get labeled, packaged, and formulated should attend. There will be many programs where labeling will be discussed but there will *only* be three workshops on dairy products where the information you need will be discussed by the experts who handle these issues on a daily basis.

For more information contact the IDFA Marketing and Training Institute, 888 Sixteenth Street, NW, 2nd Floor, Washington, DC 20006-4103, (202)296-4250.

Army Veterinarians Play Key Role in Desert Storm Readiness

Seventh Medical Command veterinary services' support to Operation Desert Shield and Desert Storm was two-dimensional. First, a 30-member veterinary detachment deployed from Europe to Saudi Arabia in September 1990. Second, veterinary food service personnel inspected several thousand tons of food destined for Southwest Asia between August 1990, and March 1991.

In late August of last year, 7th MEDCOM was notified that the skills of veterinary support personnel from U.S. forces in Europe were required for Desert Shield operations. Soldiers with their necessary equipment from three locations in Germany -- Berlin, Muenchweiler and Augsburg -- formed the 483rd Medical Detachment (Veterinary Services) and assembled at Landstuhl Army Regional Medical Center for final preparations. The unit departed Sept. 10 and was one of the first support units to arrive in the gulf.

The 483rd was the pivotal veterinary detachment in Southwest Asia. It assumed the bulk of the food plant sanitary inspection mission and began inspecting facilities throughout Saudi Arabia, the United Arab Emirates, Oman, Bahrain and Qatar.

Later on, when U.S.-based veterinary detachments arrived, the 483rd trained and provided expertise to food inspection units in all the U.S. armed forces. Personnel from the 483rd also assisted preventive medicine specialists in the inspection of dining facilities upon request.

Though the 483rd was one of the first combat service support units to arrive in Southwest Asia, it was one of the last to return to home station. The final elements returned to Germany on Sept. 10, 1991. After hostilities ended in the gulf region, the soldiers of the 483rd supported food inspection, civil affairs and animal welfare missions in Kuwait.

The success of the 483rd and the veterinary service specialists who remained in Europe during Operation Desert Shield and Desert Storm can be attributed to several factors. The skills acquired during the daily European food inspection mission, scheduled unit training and participation in major military exercises -- all contributed to their superlative performance.

Any questions regarding the article should be addressed to: Headquarters, 7th Medical Command, Attn: Public Affairs Office, APO NY 09102-3304, or telephonically at 49-6221-172706.

In Memory of these IAMFES Members

William Carroll Frazier, 1895-1991
Honorary Life Member of IAMFES

William Carroll Frazier, Emeritus Professor of Bacteriology at the University of Wisconsin-Madison, died on August 21, 1991, just five weeks before his 96th birthday. A native of Madison, Dr. Frazier attended the University of Wisconsin and earned the B.S. degree in 1917 and the Ph.D. degree in 1924. For the next 10 years he did research in the Dairy Division, United States Department of Agriculture, Washington, DC, but in 1934 he returned to the University of Wisconsin to start a new program in food microbiology. Dr. Frazier was a professor in the department for 32 years, 12 of them as chairman. After serving as chairman, he returned to full-time teaching and research in 1955. The years from 1955 until his retirement in 1966 were among the most productive of his career.

Throughout his faculty experience Dr. Frazier taught courses in dairy and food microbiology. In the early years he also taught discussion sections and laboratories in general bacteriology. He was an excellent teacher, well organized, thorough and businesslike, but not stodgy or dull. He was fair and patient with his students and he had a wonderful sense of humor. Dr. Frazier was the author (and later co-author) of *Food Microbiology*, a popular and widely used textbook; co-author of *Microbiology, General and Applied*, a textbook for beginners; and co-author of laboratory manuals for general, dairy and food microbiology.

Dr. Frazier approached research in the manner of Babcock, Russell and the other greats of the Wisconsin Agricultural Experiment Station. First and foremost, he never forgot who he worked for. The people of Wisconsin paid his salary and the people of Wisconsin deserved his service. He did not do research just to have fun or to satisfy his personal curiosity; he did research to solve problems that needed to be solved. These traits and attitudes emerged on his first job, when he and his associates at the U.S.D.A. worked out the complicated bacterial interactions involved in the manufacture of Swiss cheese. They were equally evident in later studies on the microbiology of market milk, concentrated milk, brick cheese, Cheddar cheese and alfalfa silage. He worked out the microbiological bases for practical systems of handling milk in bulk on the farm. He did pioneering studies on heat resistance and moisture requirements of bacteria important in foods; and he explored a host of other problems of immediate importance to society. During World War II, for example, he shifted his research emphasis to penicillin production in direct support of the war effort. Projects such as these brought Dr. Frazier into close contact with faculty in other departments. He was a team player and got along well with everyone. During his research career Dr. Frazier supervised the training of 32 M.S. and 30 Ph.D. candidates. He published about 90 scientific papers.

Dr. Frazier joined the Society of American Bacteriologists (now American Society for Microbiology) in 1920. He served the Society as Councillor, Secretary-Treasurer (2 years), Program Chairman (4 years), Associate Editor of *Bacteriological Reviews* (14 years), and Associate Editor of the *Journal of Bacteriology* (7 years). He was named an Honorary Member of ASM after he retired. Dr. Frazier was a Life Member of the American Dairy Science Association, Charter Member of the Institute of Food Technologists, Honorary Life Member of the International Association of Milk, Food and Environmental Sanitarians, Fellow of the American Association for the Advancement of Science, and Member of the Wisconsin Academy of Arts, Letters and Sciences as well as the Washington, DC Academy of Science.

Dr. Frazier is survived by his widow, Hildegarde; a son,

William R. Frazier; a sister, Mildred Bruff; three grandchildren and five great grandchildren.

Howard H. Ferreira

Howard H. Ferreira, 73, passed away August 21, 1991. A Rockford resident since 1952, he retired from Dean Foods Co. in 1983, as corporate quality control plant inspector. He was a registered sanitarian in the state of Illinois holding a state license for structural pest control.

Mr. Ferreira was the former president of the Dairy Technology Club; member of the Agriculture Council since 1940; long-time member of IAMFES; former president of the Illinois Milk, Food and Environmental Sanitarians; in 1982 he received the Harold Barnum Industry Sanitarian of the Year award presented by the IAMFES in Louisville, KY; and also the Robert M. Scott Award at the 1982 Environmental Laboratory Seminar in Springfield.

Survivors include his wife, Dorothy; three sons, David Ferreira, Moorhead, MN, Allen Ferreira, Indianapolis, IN, and Steven (Patricia) Ferreira, Livermore, CA; six grandchildren and one great-grandson. Predeceased by parents and one grandson.

Ralph B. Smith

Ralph B. Smith passed away in June, 1991. Mr. Smith was a Dairy Food Specialist at the California Department of Food and Agriculture, Tulare, CA. He has been an IAMFES member since 1988.

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Food and Environmental Hazards to Health

Acute and Chronic Poisoning from Residential Exposures to Elemental Mercury - Michigan, 1989-1990

From May 1989 through November 1990, eight episodes of elemental mercury exposure in private residences or schools in the Untied States were reported to the Agency for Toxic Substances and Disease Registry (ATSDR). The case studies in this report document two of these episodes (both in Michigan) of residential mercury poisoning - one involving acute mercury exposure, and the other, chronic exposure to elemental mercury. These episodes illustrate the differing clinical and toxicologic manifestations of acute and chronic mercury poisoning.

Episode 1. On August 7, 1989, four adult occupants (two men and two women ranging in age from 40 to 88 years) of a private home were hospitalized for evaluation of nausea, diarrhea, shortness of breath, and nonspecific chest pain. During hospitalization, the patients experienced progressive dyspnea and pulmonary insufficiency. On August 11, investigators learned that one of the patients had been smelting dental amalgam in a casting furnace in the basement of the home in an attempt to recover silver from the amalgam. Mercury fumes released during the operation apparently had entered air ducts in the basement and had circulated throughout the house.

Because of this mercury vapor exposure, chelation therapy with dimercaprol was initiated in the patients. On August 12, urine mercury concentrations from three of the patients ranged from 94 to 423 µg/L; serum mercury concentrations from two patients were 127 and 161 µg/L.

Despite chelation therapy and vigorous ventilatory support treatment, the condition of the patients continued to deteriorate. All of the patients died within 11-24 days after exposure to the mercury vapor. The cause of death was considered to be mercury poisoning, which resulted in adult respiratory distress syndrome and subsequent respiratory failure. Postmortem mercury concentrations in organs from the four patients were 300-2100 µg/g (kidney), 3-2400 µg/g (liver), <1-100 µg/g (brain), and 1-150 µg/g (lung); concentrations in blood ranged from 58 µg/L to 369 µg/L.

Measurements of ambient indoor air concentrations of mercury taken 11-18 days after the exposure were as high as 786 µg/m^3 in the basement and 912 µg/m^3 on the first floor. The house was extensively cleaned to reduce the mercury contamination; however, decontamination efforts did not reduce indoor air mercury concentrations to an acceptable level, and the house was subsequently demolished.

Episode 2. On August 21, 1989, a young girl was admitted to the hospital because of impaired gait. She was diagnosed as having a postinfectious viral syndrome and was discharged on August 23. On September 11, she was readmitted to the hospital when she could no longer walk. On September 19, an older sister of the patient was admitted to the hospital with similar symptoms. Clinical evaluation of both girls revealed numbness in the fingers and toes, absence of deep tendon reflexes, elevated blood pressure, and an elevated level of protein in the cerebrospinal fluid. Mercury poisoning was diagnosed, and chelation therapy was started in the two children. Subsequently, on October 3, their asymptomatic brother was hospitalized for a chelation challenge, which detected a substantial mercury load.

After chelation therapy, the brother remained asymptomatic, and the older sister improved and was discharged from rehabilitation therapy. The index patient had numerous residual neurologic abnormalities, including visual field defects, mild upper and lower extremity weakness, and some emotional lability.

Subsequent investigations revealed that earlier that summer about 20 cm^3 of liquid mercury had been spilled in the boy's bedroom. Examination of the house using a mercury vapor analyzer detected indoor air mercury concentrations of 10-40 µg/m^3. Clean-up efforts included removing carpet from several areas in the house, replacing the carpet and wooden subfloor in the bedroom where the spill occurred, and commercially cleaning all other carpet and furniture.

Editorial Note: Although the toxic properties of elemental mercury have been recognized since at least the 1500s, occupational and residential exposures to mercury remain a source of poisoning.

Although death is an infrequent outcome of acute exposure to mercury, the first episode described in this report illustrates the clinical progression following exposure. Patients are usually asymptomatic during the first 1-4 hours following acute exposure to high air concentrations of mercury vapor. Symptoms start abruptly and may include fever, chills, nausea, general malaise, and respiratory difficulties (shortness of breath, pain and tightness in the chest, and paroxysmal coughing). In severe cases, pulmonary edema may cause death within a few days.

After inhalation, elemental mercury is readily absorbed through the alveolar membranes and transported by blood to the brain and other tissues of the nervous system. Mercury is rapidly converted by the blood to mercuric ions, which are then excreted in the urine and feces. Diagnosis of mercury toxicity is aided by the detection of elevated concentrations of mercury in blood or urine samples. Background urine concentrations of mercury in persons with no unusual exposure to mercury ranged from 1 to 25 µg/L; 95% of such urine samples contain <20 µg/L. Although urine mercury concentrations correlate poorly with manifestations of mercury poisoning, symptoms may appear when the urine mercury concentrations exceed 300 µg/L. In unexposed persons, blood mercury concentrations are usually <3 µg/L, but may be substantially higher in persons with a high dietary intake of fish.

Residential and occupational cases of mercury poisoning more commonly result from chronic exposures, as illustrated by the second episode described in this report. Spilled mercury gravitates to cracks in the floor and into the pile of carpets. Even though it may not be visible, the mercury can slowly volatilize indoors and may lead to chronic mercury poisoning through inhalation exposure. Vacuuming a contaminated area may facilitate the spread of mercury vapor throughout the house.

The potential for indoor mercury exposure is increased when indoor air exchange is reduced (e.g., when doors and windows are kept closed). Warm air from heating ducts and vents may enhance volatilization when circulated over spilled mercury. Mercury vapor concentration is likely to be higher near the floor, and children may be exposed to higher concentrations of mercury than adults.

The vagueness of the early clinical signs of central nervous system (CNS) toxicity characteristic of mercury poisoning often result in misdiagnosis. If exposure to mercury continues, the severity of symptoms may progress as a function of mercury concentration, length of exposure, and individual sensitivity. The CNS toxicity of mercury is both neurologic and psychologic. Fine tremors in the fingers, eyelids, and lips are early signs of mercury toxicity. Tremors in the hands and arms may interfere with precision movements and impair skills such as handwriting. Common psychopathologic symptoms include depression, irritability, exaggerated response to stimuli, excessive shyness, insomnia, and emotional instability.

Potential sources of elemental mercury in the home include mercury switches and mercury-containing devices such as thermostats, thermometers, and barometers. Family members may also bring into the home elemental mercury obtained from laboratories, dental offices, or other industrial sources.

In the *ATSDR Toxicological Profile for Mercury*, the minimal risk level (MRL) for chronic inhalation exposure to elemental mercury was determined to be 0.3 $\mu g/m^3$. An MRL is an estimate of the daily human exposure to a chemical that is likely to be without an appreciable risk of deleterious (noncarcinogenic) effects during a specified period of exposure. Chronic inhalation exposure to elemental mercury concentrations below the MRL would not be expected to result in adverse health effects.

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Sanitary Design

A Mind Set (Part VI)

Donald J. Graham
Senior Food Technologist
Sverdrup Corp.
St. Louis, MO

The main idea behind these articles is to create an awareness of sanitation in all aspects of food plant design, construction, renovation, operation and processing. This concept was affirmed in the sanitation presentations at the 1991 Food and Dairy Show in Chicago. There were a number of references to "philosophy," "attitude," and an overall consensus that sanitation must become a part of the thinking of everyone connected with a food processing operation. The battle against food-borne illness is not becoming any easier with the identification of organisms previously unidentified as causative agents. Therefore, everyone's attention to all aspects of food processing and plant sanitation is the MIND SET we are striving to create.

The FDA "Dairy Products Initiatives Preliminary Status Report" makes the statement: "Airborne contamination is strongly suspected as the cause of some pathogenic contamination. A comprehensive assessment of the air supply and utilization, both processing and ventilation air should be conducted."

Unfiltered air and negative air pressure in plant areas where the product is exposed are both major causes of microbial contamination in the plant environment. Heating, Ventilation and Air Conditioning (HVAC) systems are as important to sanitary design as the design and construction of floors, walls and ceilings.

One of the first considerations of the processing plant design is positive air pressure zones. The zone with the highest pressure should be the area where the product is last exposed to the open air. Normally this area is where the prepared or formulated product is packaged and sealed. The air from this zone flows outward to the processing/preparation zone. From there the air flows outward to the warehouse and the ingredient or other reception areas. It has been found that dust collection systems perform better if used in an area under a positive pressure. Outside air makeup is not always needed but can be blended with reused, filtered inside air. This makes it easier to maintain the recommended positive pressure condition of 10% over the designed exhaust capacity of the ventilation systems. If the HVAC system is correctly designed, whenever an outside door is opened a person can feel the air stream exit the building.

Unfortunately, most older plants and many of the newer plants have so many exhaust fans that they create negative pressure within the plant. In a negative air pressure situation, whenever an outside door or window is opened the incoming breeze brings in air containing water, gases, dust, chemicals, virus, bacteria, yeast, mold, pollen, insects and other debris contaminate the food and food contact surfaces. Microorganisms exist in air as passengers, within moisture droplets and as isolated organisms. This continual influx of unfiltered air makes the overall cleaning and sanitation of the plant, equipment, overhead pipelines, and other structural features much more difficult to clean and keep clean. A well filtered air intake system reduces potential product contamination and makes the cleanup of the plant easier and quicker. Directly related to the air pressure in the plant is the number of air turns necessary to maintain clean air, remove any odors, smoke or other air contaminates emanating from the process. USDA mandates a minimum of six air turns per hour in inspected meat, poultry and egg plants under FSIS continuous inspection. The number of air turns depends on the type of processing taking place in the plant and must be designed by a competent HVAC engineer to fit the facility and the process.

The air intakes and the design of the duct work are key elements in the sanitary design of the entire HVAC system. If a precast double tee roof is used, the duct work can be made an integral part of the roof by putting sheet metal across the legs of one of the tees. However, if this method is used the concrete *must* be sealed to prevent organisms from getting a food-hold in the concrete and causing contamination to the rest of the plant. Access ports should be provided every eighteen to twenty feet so the interior of the duct can be cleaned. If suspended duct work is chosen round ducts are preferred. Square or rectangular ducts should be installed tight to the ceiling and caulked to prevent access to the top of the duct. Suspended square ducts with either a sloped or rounded top preventing debris from collecting and making the tops easier to clean is the next best design. The duct itself must have doors every eighteen to twenty feet to permit cleaning of the interiors. It must have a double wall cleanable casing with a good closed cell insulation sealed between the walls. Under no circumstances should there be open insulation on the inside of the duct work. It becomes wet from condensation, traps dirt and can spread contamination throughout the plant since it is impossible to clean. Swab tests should be performed on the duct interiors on a periodic basis to track microbial counts. Plates should be exposed to plant air to monitor in-plant microbial air quality. Fiberglass batts are not recommended anywhere in a food plant and should never be used in or on duct work. The ducts should be hung with standard straps or from a trapeze hanger as long as the trapeze hanger is not equipped with all-thread rods which is not acceptable in a food plant

due to the difficult and time consuming task of trying to clean all the dirt out of all the threads. A job for a person and a toothbrush. All flange seams should be caulked with a good grade caulking. In dry handling plants the longitudinal seams should be continuously welded to prevent insect infestation.

The air intake units are usually mounted on the roof of the facility. The units should be filtered to a degree demanded by the quality of the incoming air and the contamination potential of the product being produced in the plant. Usually the filters in a standard installation remove particulates fifty microns or larger. However, there are filters that will remove particulates the size of a virus (.01 microns). In high insect areas, an insect screen can be placed ahead of the filters. It should be easily accessible for frequent cleaning to prevent interruption of the air flow. The type of filters used also depend on the use of the air. Is it to be heated, cooled, humidified, dehumidified or used as is? Is it to be used directly on the product or just as a space conditioner? These are some of the questions that must be considered when selecting the type of filters to be used.

The ideal air system can be summarized as follows:

It cools and/or heats to the degree required

It humidifies and/or dehumidifies to the degree required

It filters for clean air

It keeps duct work out of the processing room

It is not a source of contamination

It distributes the air to the necessary places

It pressurizes the room

High smog areas, heavy dust areas and other areas high in air contaminants require well designed air handling systems to prevent product contamination.

The design of exhaust stacks and their location in relation to the intake air equipment is an important design issue. The exhaust stacks should have a hood to keep out rain and snow and to prevent downdrafts. The openings should have a noncorrosive insect screen with a half inch mesh over them. A well designed stack has a self closing damper to close it off when not in operation.

The location of the exhaust stack on the roof should not cause the exhaust air to be picked up by the intake ducts. A good design places the exhaust stack higher than and ideally downwind of the intake ducts. When renovating older plants and adding equipment that requires ventilation, care must be taken in placement of the exhaust and/or the intake ducts so the intake ducts are not in line with dirty air exhaust ducts. It is small oversights like the misplacement of ducts that can and do cause contamination problems in food processing plants that sometimes take months and many dollars to track down.

Pipe hangers, duct hangers and conduit hangers are always a point of discussion in a properly designed plant. The basic criteria for these hangers is no flat surfaces for dust, debris etc., to collect and they must be strong enough to secure the pipe they are supporting. In a plant that is designed to sanitary criteria pipe hangers *should not* be hung using all thread rod or unistrut (B-Line Channel). Most construction packages contain references to the use of both all-thread and unistrut. The engineer must be constantly alert against the use of both of the above. All-thread rod is not easily cleanable unless someone uses a toothbrush. Unistrut also falls in the uncleanable category.

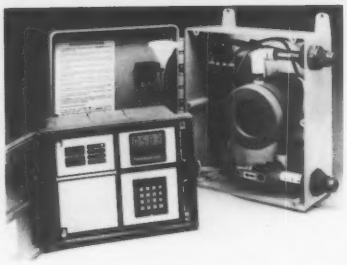
Some suggested designs for pipe hangers or holders are: Trapeze type fabricated with flat plate vertical supports with round horizontal members welded to the flat plate. The preferable material is stainless steel but under some conditions and in some areas galvanized and/or black iron can be used. Other designs include flat plate with holes bored in it. Usually conduit is threaded through these plates hung from the ceiling. Some hangers are fabricated using square closed end tubing turned at a 45 degree angle so the pipes rest on the angle. Pipe clamps are another discussion area. Many of them have flat surfaces, exposed threaded bolts and are not considered sanitary. Compromises usually have to be made in this area since there are very few, if any, completely sanitary pipe clamps and supports. A periodic cleaning and sanitizing procedure is needed to supplement pipe hanger design efforts. Other supports include single bar hangers extending out from the walls that carry single pipes, as well as tubular frames that can carry multiple pipes. All of the hanger types mentioned have been used successfully in food plants. Plants should stay away from hangers that are constructed with flat horizontal members and any that will provide a hiding place for insects and microbes. Pipe hangers should be constructed so they are simple, easy to clean and to keep clean. All openings must be sealed and, if round or square tubing is used, the ends must be welded shut. Sometimes floor pipe supports are used but they are usually difficult to clean around.

A final reminder - No all-thread rod or unistrut should be used in a sanitary new plant design or plant renovation especially for pipe hangers or conduit support.

References

FDA Dairy Products Initiatives Preliminary Status Report; September 1986; page 5; Food and Drug Administration Center for Food Safety and Applied Nutrition Division of Cooperative Programs Milk Safety Branch, Washington, DC.

Industry Products



95T/8220 Turbidimeter System Wins Governor's New Product Award

A new turbidimeter system designed by Great Lakes Instruments, Inc. was recognized as a winner in the Governor's 22nd Annual New Product Award Competition.

The microprocessor-based 95T/8220 system meets the stringent requirements of clean water applications, measuring ultra-low turbidity levels, as well as levels to 100 NTU. The system consists of a unique pulsed light, four-beam sensor and an analyzer/controller which compares measurements using a radiometric method. This innovative measurement technique cancels out error factors due to drift, gain and light source aging, producing highly accurate, stable readings.

Preprogrammed diagnostic routines continuously poll both the system memory and sensor signals to detect system problems. The diagnostics provide early warning and failure alerts for mechanical, electronic, software, and maintenance problems. The system also features automatic color compensation, a bubble rejecting sample chamber and continuous zero point check. The system is ideal for critical monitoring and controlling of raw water, potable water, filtered water and final product clarity.

Great Lakes Instruments, Inc., is a leading instrumentation specialist in the measurement and control of pH/ORP, conductivity, flow, level, dissolved oxygen and turbidity to the process, power and water/wastewater industries.

Great Lakes Instruments, Inc. - Milwaukee, WI

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For a free 15 page full color catalog:
Solomat Instrumentation - Stamford, CT

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Labconco Offers Video on New Protector® Controlled Atmosphere Glove Box

Labconco Corporation has produced a video detailing the full line of Protector® Controlled Atmosphere Glove Boxes. This ten minute full color video includes close up views and demonstrations of key features and benefits. Specifications, dimensional data and accessory information are also provided.

The video introduces the Protector Fiberglass Controlled Atmosphere Glove Box in six models. Features of the box which are detailed include a pressure relief bubbler, pressure control module, and purge/fill control module.

In addition to fiberglass models, the Portector® Controlled Atmosphere Glove Box comes in stainless steel lined models. All Protector Glove Boxes are factory tested while pressurized with helium at 8 inches water gauge. Each box has no detectable leaks greater than 10^{-6} cc's per second, or 31.55 cc's per year.

For a free copy of the Protector® Controlled Atmosphere Glove Box Video:
Labconco Corp. - Kansas City, MO

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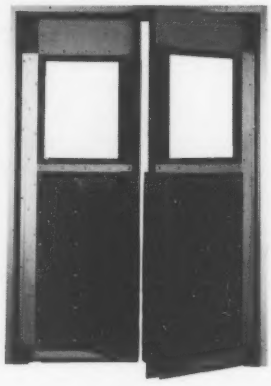

RubbAir Introduces a New Rigid Traffic Door

RubbAir Door has introduced a new rigid traffic door specifically engineered to withstand heavy motorized traffic even in areas of high humidity and temperature extremes.

Designated the Poly-Kor XHD, the new door "provides a degree of strength and durability that, until now, has not been available in a rigid traffic door" according to Jim Collins, General Manager for the company. He added that, "the unitized, welded construction of the Poly-Kor XHD consists of a rugged, lightweight tubular aluminum frame, welded aluminum stile and high strength aluminum rivets. PGA facings, available in a full range of colors, won't dent, chip, peel or corrode."

Standard features of the Poly-Kor XHD include: full perimeter air seals; full width, 24" high double-glazed vision panels; safety cushioned nosing; 42" high heavy duty, tear-drop bumpers; and corrosion resistant hardware. All door materials are USDA, MPI approved.

Each Poly-Kor XHD door is custom manufactured for a specific door opening and is a full 1 3/4" thick. The door is completely insulated with closed cell urethane foam to provide maximum environmental separation.

RubbAir Door Division, Eckel Industries, Inc. - Ayer, MA

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Control One Offers Temperature and Humidity Data Loggers

CONTROL ONE sets new standards in the data acquisition industry. The latest innovative product line from CONTROL ONE is their new multichannel and single channel Temperature and Humidity data loggers which offer the highest accuracy and reliability compared to any that are found in the industry. These recorders match performance with highly sophisticated instrumentation which are used in scientific applications throughout the world. Now for the first time temperature and humidity monitoring systems are available at a low cost and can be used in the monitoring of temperatures and humidity conditions in distribution, storage and transport of perishable goods around the world, various scientific and environmental studies, USDA certification of fruits and meat and poultry processing, FDA monitoring of food safety and implementation of HACCP program, aquaculture, nurseries, HVAC, refrigeration and a variety of other applications.

The new CONTROL ONE temperature recording systems has an accuracy 0.1 deg. Celcius throughout its 10 year lifetime without the need for calibration. A substantial cost saved compared to others which requires calibration every time they are used. CONTROL ONE humidity recorders also offer high accuracy in that it will maintain a 1% accuracy with a range of 5% to 95% relative humidity throughout its lifetime.

All CONTROL ONE systems are portable, fully PC programmable, tamperproof and ruggedized for harsh environments. They can collect over 250,000 measurements in its solid state memory and fully epoxied including lithium batteries will guarantee operation for the next 10 years.

CONTROL ONE, INC. - Stamford, CT

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PHT-422-1 PH Transmitter from Presto-Tek Corp.

The Presto-Tek model PHT-422-1 industrial pH transmitter is designed to accommodate virtually all process loop applications. The instrument includes a LCD display for continuous monitoring and simplified calibration. Potentiometers for zero, span, pH Cal and slope are easily reached for calibration. A fixed resistor may be used for manual temperature compensation, or choose our combination pH/thermistor electrode for automatic temperature compensation. The user may scale the 4-22 mA output for full 0-14 pH range, any 5, any 2, or any 1 pH units.

Presto-Tek Corporation -
Los Angeles, CA

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Safe Handling of Chlorine Dioxide Video

Drew Industrial Division, a leader in chlorine dioxide technology, announces completion of a comprehensive video cassette covering all aspects of safe handling and generation of chlorine dioxide in aqueous solutions.

This video introduces chlorine dioxide and its common application areas, followed by correct site requirements, personal protective equipment, safe handling and storage of all chemicals used in the generation of chlorine dioxide and the standard safety features important in the construction of chlorine dioxide generators. The new video program becomes part of Drew's safety training program for plant personnel utilizing chlorine dioxide generation equipment.

A collection of 45 years' experience in specific housekeeping, spill response and emergency notification requirements is shared with Drew's customers.

Drew Industrial Division, Ashland Chemical, Inc., a subsidiary of Ashland Oil, Inc., is a major supplier of specialty products and services for the industrial water and wastewater treatment markets.

Drew Industrial Division - Boonton, NJ

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Tri-Clover Introduces New EH Series Pump Brochure

A new two-color, four-page brochure featuring the EH Series line of high capacity, low shear centrifugal pumps is now available from Tri-Clover, Inc.

The catalog details the EH Series pumps, which are available in three sizes, and offer a choice of either Tri-Clamp®, Bevel Seat or Flanged connections. The EH Series also features five different seal types -- including Carbon Rotary, Water Cooled Rotary, Packing Gland, Packing Gland With Water and Latex to meet all your application needs. These various seals are clearly outlined, and usage recommendations are supplied in the brochure as well. In addition, there is also a complete dimension chart to help in choosing the proper size pump to meet your process requirements. Series EH features a unique one-piece "Bow-Tie" impeller design to handle delicate products gently.

Headquartered in Kenosha, Wisconsin, Tri-Clover, Inc. is a leading manufacturer of sanitary stainless steel valves, pumps and fittings, as well as flow control, batch/weigh and Clean-in-Place (CIP) systems. Founded in 1919, Tri-Clover, Inc. is now a member of the Alfa-Laval Group.

Tri-Clover, Inc. - Kenosha, WI

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"Turn-Key" Hydrostatic Level Measurement System

The new Model 7690 Liquid Level Measurement System from Computer Instruments Corp is a complete, packaged system designed to meet virtually any industrial level-measurement need. It is ready for use immediately upon installation and includes self-diagnostics for detecting fault conditions. Housed in a Nema-4X enclosure, the Model 7690 provides standard electrical output signals, local indication, and can be calibrated for measuring depths from 2.5 inches through 100 feet.

The Model 7690 senses hydrostatic pressure through a controlled purge of gas from a sensing element mounted in the liquid-containment vessel. This provides highly accurate and reliable level detection, regardless of surface foam, mist or turbulence. The 7690 system is readily applied to monitoring the level of corrosive, hazardous, molten, or cryogenic liquids, as well as water, chemical feedstocks, fuels or process liquids.

The gas purge technique allows the Model 7690 to be a "remote observer" of hydrostatic pressures; the system is isolated from the measured media and can be located away from the vessel at any convenient location. This allows easy access for field testing and calibration, as well as for service and repair. The remote installation provides low long-term maintenance cost, and facilitates direct, in-place certification for EPA or other requirements. The 7690 does not require service at the measurement point, and personnel are not exposed to the media.

The integrated Model 7690 package includes all the components required for complete purge gas control, and incorporates a specialty pressure transducer. Proprietary techniques are used to filter the pressure fluctuations generated by the gas purge. While many plants have used purge-type level measurement by assembling discrete components, the Model 7690 has been developed as a standard product for this purpose. The installed cost of this system is therefore quite low, and the instrument includes a comprehensive O & M manual.

Computer Instruments Corp. -
Westbury, NY

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E.I.L. Instruments, Inc. Introduces the EC-1000: The Latest in Environmental and Load Controllers

Customer and employee comfort and energy expense control is an essential combination in today's competitive marketplace. The EC-1000 can help reduce the costs of heating, cooling, lighting, and other time controlled loads in a variety of facilities.

The EC-1000 was designed as a multi-zone heating and air conditioning system capable of controlling up to 16 separate zones. Additional abilities include multi-channel time clock functions, facility power monitoring, demand control, logic statement control and anti-condensate heater control for refrigeration applications. Outputs are connected via easy-to-use quick connects, creating an innovative concept which limits installation and service time, translating into money savings.

Additional features of the EC-1000 are:

- Multi-Line Liquid Crystal Display for easy programming and interrogation.
- Fully programmable by keyboard or remote.
- Quick display of all setpoints, temperatures, status, run-times and historical logging.
- Housed in a rugged metal enclosure, designed to protect the equipment in the mechanical room environment.
- Remote communication via modem to P.C. style computer

Main unit input power to the EC-1000 is 12 VAC via 120/12VAC Transformer. Dimensions of the EC-1000 are 18"W x 13"H x 7"D.

E.I.L. Instruments, Inc. - Sparks, MD

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In-line: Sensors for Food Processing

BTG is a world leader in the supply of process control instrumentation for municipal and industrial applications. We have extensive experience in pulp and paper, chemical and food processing, power utilities and municipal wastewater applications. Our Process Control Division has published a newsletter which is now available to all process control professionals in the food processing industry.

Titled "*In-line: News about in-line sensors for food processing*", this newsletter highlights successful BTG instrument/sensor installations. These installations are helping various customers comply with increasing mandated environmental regulation. Additional articles discuss how customers use BTG in-line sensors to increase productivity and quality through accurate and reliable monitoring.

BTG, Inc. - Decatur, GA

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Hi-36 Polyester Film Reduces Costs, Aids Source Reduction Efforts

Packagers and converters can significantly reduce costs and contribute to source reduction programs without sacrificing performance with Hi-36 Film, a new chemically-treated, high-performance polyester from HIMAC, INC.

The new film offers significant cost savings, since the 36-gauge film offers up to 25 percent greater yield than its 48-gauge counterpart. The increased yield also provides converters with longer equipment runs before changeover, reducing downtime.

Hi-36 Film also cuts the amount of material entering the waste stream at the source by 25 percent compared to 48-gauge. In combination with one or more substrates, the film decreases overall packaging material by approximately 10 percent.

In addition, the thinner Hi-36 Film utilizes proprietary film treatments and additives and exhibits better flex-crack resistance than thicker films to provide excellent moisture and oxygen barriers. This provides flexible packaging made with Hi-36 Film with increased product shelf-life.

The high-quality production of the new film also offers better metallization and cold seal adhesion than traditional 48-gauge chemically-treated polyester films.

HIMAC, INC. - Danbury, CT

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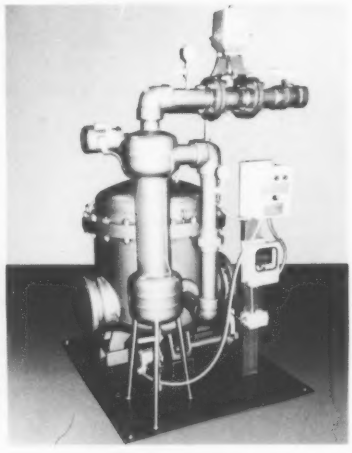

Self-cleaning Strainer, Water Conservation Design

Now, a self-cleaning strainer assembly that doesn't dump precious water down the drain. Hayward Industrial Products has found the way to minimize loss of backwash water to waste by combining the Hayward Strain-O-Matic self-cleaning strainer with a cyclone separator. The addition of controls to monitor operation allows optimum performance. Piping and mounting all components on a skid facilitates installation and lowers cost.

Self-cleaning strainers utilize a portion of the strained fluid to reverse flow back through the straining element. This fluid lifts the debris from the screen and carries it out of the strainer to waste. The amount of fluid required to accomplish cleaning is dependent upon the solids loading. It can amount to several percent of the total line flow when backwashing. Normally the backwash discharge is piped to a sewer or returned to the source. However, there are applications where this fluid cannot be dumped to a municipal sewer or local stream.

With the Hayward Model WCD (Water Conservation Design) 596, the backwash fluid is piped to a cyclone separator. Here the heavy particles are removed and the outflow from the separator is returned to the system. Fluid loss is minimal, less than 1%. Periodic dumping of the concentrated waste from the separator is performed manually or by automatic valving operated by the control system.

All components necessary to control and monitor the operation are included. This includes valves, gauges, differential pressure switch and control panel. Mounting all the components on the skid provides a compact package which lends itself to ease of installation.

Applications for WCD strainers are found, especially, in treating cooling tower water and in process or power plant cooling systems.

Hayward produces Strain-O-Matic strainers in pipeline sizes from 2" through 60". Strain-O-Matic LDP models are also available for low pressure or pump suction applications. Additionally, Hayward Industrial Products, Inc. manufactures a complete line of simplex and duplex basket strainers.

Hayward Industrial Products - Elizabeth, NJ

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Department of Agriculture

Office of the Secretary

Semiannual Regulatory Agenda: October 1991
Agency: Office of the Secretary, USDA.
Action: Semiannual regulatory agenda.

Summary: This agenda provides summary descriptions of major and nonmajor regulations being developed in agencies of the U.S. Department of Agriculture in conformance with Executive Order 12291 "Federal Regulation." The agenda also describes regulations affecting small entities as required by section 602 of the Regulatory Flexibility Act, Pub. L., 96-354.

USDA has attempted to list all regulations and regulatory reviews pending at the time of publication, except for minor and routine or repetitive actions, but some may have been inadvertently missed. There is no legal significance to the omission of an item from this listing. Also, the dates shown for the steps of each action are estimated and are not commitments to act on or by the date shown.

For further information contact: For further information on any specific entry shown in this agenda, please contact the person listed for that action.

Requests for copies of the agenda should include a self-addressed, stamped envelope and be directed to: Regulatory Agenda, OBPA, Office of the Secretary, Room 147-E, Administration Building, U. S. Department of Agriculture, Washington, DC 20250.

Dated: August 23, 1991.
Marvin Shapiro,
Chief, Legislative, Regulatory, and Automative Systems Division.

Voluntary Inspection of Egg Products and Grading

Significance: Agency Priority
Legal Authority: 7 USC 1621 to 1627 Agricultural Marketing Act of 1946
CFR Citation: 7 CFR 55
Legal Deadline: None

Abstract: The proposal will broaden the definition of "Product" to include certain products that are now exempt and will change the terminology describing facilities to be furnished by official plants. These are the same changes being proposed for 7 CFR Part 59 and would make both regulations consistent to avoid confusion among the inspectors who must enforce both regulations.

Timetable:

Action	Date	FR Cite
NPRM	00/00/00	

Small Entities Affected: Undetermined
Government Levels Affected: Undetermined
Agency Contact: Janice L. Lockard, Chief, Stn. Branch, Poultry Division, Department of Agriculture, Agricultural Marketing Service, Room 3944 South Building, P.O. Box 96456, Washington, DC 20090-6456, 202-447-3506.
RIN: 0581-AA58

Grading of Shell Eggs

Significance: Agency Priority
Legal Authority: 7 USC 1621 to 1627 Agricultural Marketing Act of 1946
CFR Citation: 7 CFR 56
Legal Deadline: None

Abstract: The proposal clarifies and updates provisions of the regulations in response to changing industry practices, program direction, and policy interpretation. Changes to reflect current industry practices would affect grading room requirements, references to the tape used to seal cartons, and the reuse of oil from shell egg protecting operations. Changes to clarify and strengthen existing regulations would affect the definition of "quality assurance inspector," the facilities and equipment required for graders, the temperature of the spray rinse in shell egg cleaning operations, and the nest run B quality shell definition. Other changes will be to require a specific level of humidity in cooler rooms to help maintain egg quality and to eliminate wholesale grades and weight classes because they are no longer used.

Timetable:

Action	Date	FR Cite
NPRM	00/00/00	

Small Entities Affected: Undetermined
Government Levels Affected: Undetermined
Agency Contact: Janice L. Lockard, Chief, Stn. Branch, Poultry Division, Department of Agriculture, Agricultural Marketing Service, Room 3944 South Building, P.O. Box 96456, Washington, DC 20090-6456, 202-447-3506.
RIN: 0581-AA60

Importation of Certain Animals and Poultry and Certain Animal and Poultry Products-Communicable Animal Diseases

Significance: Agency Priority
Legal Authority: 7 USC 1622; 19 USC 1306; 21 USC 102 to 105; 21 USC 111; 21 USC 134a; 21 USC 134b; 21 USC 134c; 21 USC 134d; 21 USC 134f; 21 USC 135; 31 USC 9701
CFR Citation: 9 CFR 92
Legal Deadline: None

Abstract: The Department currently regulates the importation of certain animals and animal products to prevent the introduction of communicable animal diseases into the United States. With certain exceptions, most animals imported into the United States must be quarantined upon arrival at facilities operated by the Federal Government; only sheep, birds, and horses may be quarantined in privately-operated facilities. Some importers have expressed interest, however, in importing ruminants and swine, other than sheep, in greater numbers per shipment than can be handled at existing Federal facilities. The Department is considering amending the regulations to allow all species of domesticated ruminants and swine, from countries free of certain serious diseases, to be quarantined upon arrival in the United States at privately operated facilities.

Timetable:

Action	Date	FR Cite
NPRM	02/00/92	
NPRM Comment Period End	04/00/92	
Final Action	00/00/00	

Small Entities Affected: Undetermined
Government Levels Affected: Undetermined
Agency Contact: Sam Richeson, Senior Staff Veterinarian, Import-Export Animals Staff, Department of Agriculture, Animal and Plant Health Inspection Service, Room 764 Federal Building, 6505 Belcrest Road, Hyattsville, MD 20782, 301-436-8144
RIN: 0579-AA28

Importation of Certain Animals and Poultry and Certain Animal and Poultry Products-Prevention of Poultry Diseases

Significance: Agency Priority
Legal Authority: 7 USC 1622; 19 USC 1306; 21 USC 102 to 105; 21 USC 111; 21 USC 134a to 134d; 21 USC 134f; 21 USC 135; 31 USC 9701
CFR Citation: 9 CFR 92
Legal Deadline: None

Abstract: The Department currently regulates the importation of poultry and poultry products, including eggs for hatching, to prevent the introduction of certain poultry diseases into the United States. These regulations need to be revised to add restrictions to prevent the introduction of Salmonella enteritidis, serotype enteritidis, phage-type 4 (referred to below as S. enteritidis, phage-type 4), a virulent type of Salmonella that has not been detected in poultry flocks in the United States. Canada is the only country other than the United States in which poultry flocks are recognized as being free of S. enteritidis, phage-type 4. Because poultry and poultry eggs for hatching are being imported from countries where this organism is considered to exist, the Department needs to take prompt action to prevent its introduction into the United States. Safeguards under consideration include testing of individual poultry of the flock of origin in the country of origin, and testing and inspection during quarantine in the United States.

Timetable:

Action	Date	FR Cite
Interim Final Rule	01/00/92	
Interim Final Rule Comment Period End	03/00/92	
Final Action	09/00/92	

Small Entities Affected: Undetermined
Government Levels Affected: Undetermined
Agency Contact: Keith Hand, Senior Staff Veterinarian, Import-Export Animal Staff, Department of Agriculture, Animal and Plant Health Inspection Service, Room 830, Federal Building, 6505 Belcrest Road, Hyattsville, MD 20782, 301-436-8172.
RIN: 0579-AA38

Chicken Disease Caused by Salmonella enteritidis

Significance: Regulatory Program
Legal Authority: 21 USC 111 to 113; 21 USC 115; 21 USC 117; 21 USC 120; 21 USC 123 to 126; 21 USC 134a; 21 USC 134b; 21 USC 134f
CFR Citation: 9 CFR 82
Legal Deadline: None
Abstract: USDA has established regulations to control the spread of Salmonella enteritidis serotype enteritidis (SE) in egg-type chicken breeding flocks and egg production flocks. These regulations restrict the interstate movement of table eggs, hatching eggs, and newly-hatched chicks that may be infected with SE, and require testing of egg production flocks that have been associated with SE outbreaks in poultry or humans. We believe that future SE control efforts must move beyond the present program's emphasis on identifying and cleaning up infected flocks by trace-back from human disease outbreaks. SE control programs should move toward risk reduction throughout the continuum of food production, distribution, preparation, and consumption, and identify critical control points in this continuum for preventing SE spread. USDA is currently developing necessary research data and standards to measure success in SE control. USDA will then coordinate with other involved Federal agencies to determine whether there is a need for new or revised Federal regulations.

Timetable:

Action	Date	FR Cite
Final	01/30/91	56 FR 3730
Final Action	01/30/91	
Final Action Effective	01/30/91	
Final Action Effective	01/30/91	

Next Action Undetermined
Small Entities Affected: None
Government Levels Affected: State, Federal
Agency Contact: Dr. John Mason, Director, Salmonella Task Force, VS, Department of Agriculture, Animal and Plant Health Inspection Service, Room 205, Federal Bldg., 6505 Belcrest Road, Hyattsville, MD 20782, 301-436-4363.
RIN: 0579-AA45

Federal Register/Vol. 56, No. 203/Monday, October 21, 1991/Unified Agenda

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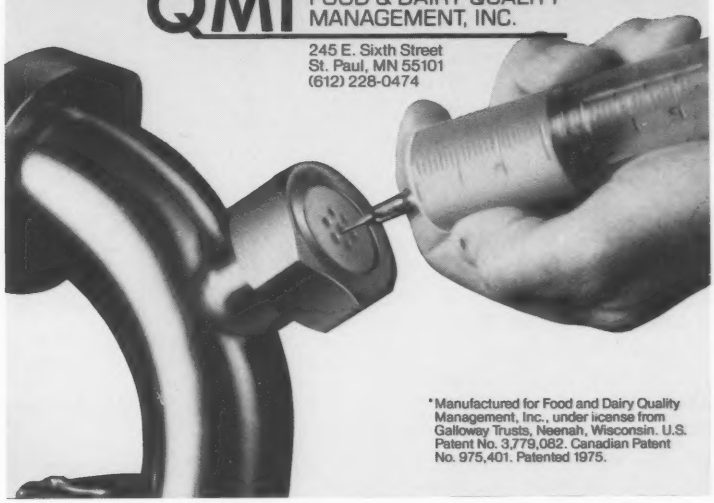

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Affiliate News

Marla Webster (L), incoming president, receiving the Presidential Gavel from Judy Willingham, outgoing president.

Kansas Association of Sanitarians 62nd Annual Educational Conference Emporia, Kansas October 23-25, 1991

The annual educational conference was held on October 23-25, 1991, in Emporia at the Holidome. The agenda included discussions on pesticide laws, consumer protection fraud, FDA food labeling initiative, environmental training for sanitarians, groundwater protection and well construction, solid waste and landfill management, bioassay techniques for stream water, rodent and vector control, nuclear disaster planning, ag waste control, and USDA meat and poultry inspections.

Displays and breaks were provided by Hime Environmental Products, Mid American Dairymen, Enzytec, and Infiltrator Systems. Evening activities included a pork chop cook-out, awards banquet, hospitality by Auto-Chlor, hot tub parties, and pickin' and grinnin'.

Officers were elected as follows: President, Marla Webster, R.S.; 1st Vice President, Ann Scheve, R.S.; 2nd vice president, Ron Tubb, R.S.; Secretary/Treasurer, John Davis, R.S. Section representatives are Jerry Vornhold, B.J. Hope, and Jim Twigg, R.S.

Sanitarian of the Year, 1991, is Charlie Penner, Marion County Health Department. Special Recognition awards went to Robert Meeker and Dean Duke. Scholarships were awarded to Mitzie Hulsing, sophomore in nutrition, and Mark Fleury, freshman in chemical engineering. Both are students at Kansas State University. Immediate past president, Judy M. Willingham, R.S., was recognized.

Upcoming IAMFES Affiliate Meetings

1992

JANUARY

•**22, Connecticut Association of Dairy & Food Sanitarians, Inc. Annual Meeting** will be held at the Hawthorn Inn, Berlin Turnpike. For more information please contact Don Shields, CT Department of Agriculture, 165 Capitol Avenue, Hartford, CT 06106; (203)566-3279.

FEBRUARY

•**18, Georgia Association of Food & Environmental Sanitarians Annual Meeting** will be held at the Holiday Inn North/Airport, Atlanta, GA. For more information contact Mark Harrison, GAFES Secretary, Department of Food Science & Technology, Athens, GA 30602; (404)542-1088.

•**25-27, Kentucky Association of Milk, Food & Environmental Sanitarians, Inc. Annual Meeting** will be held at the Holiday Inn South, Louisville, KY. For more information contact Judy True, KAMFES, Inc., P.O. Box 1464, Frankfort, KY 40602; (502)564-7181.

APRIL

•**1, Ohio Association of Milk, Food & Environmental Sanitarians Annual Meeting** will be held at the Monte Carlo Restaurant, Columbus, OH, located at I-270 and Cleveland Avenue. Registration 8:30 a.m. Featured speaker will be Doug Young, OH Department of Health. For more information contact Don Barrett, Health Department, 181 S. Washington Boulevard, Columbus, OH 43215; (614)645-6195.

Left to right: Marla Webster, KAS President; Bob Meeker, Special Recognition; Dean Duke, Special Recognition; Mark Fleury, Scholarship Recipient; Ron Tubb, Awards Chair; Mitzie Hulsing, Scholarship Recipient; Charlie Penner, Sanitarian of the Year.

WPSHA Conference Targeted Public, Media, Industry

The theme for the Wyoming Public Health Sanitarians Association (WPHSA) 19th Annual Educational Conference was "Poisons in Our Environment: Are We Really Killing Ourselves?" The conference was held September 17-19 in Cheyenne at the Holiday Inn. The first day of the conference was designated as Media - General Public Day to allow everyone a change to acknowledge our organization.

On the agenda were controversial subjects that have a great impact on our environment and are of interest to the people in Wyoming. The topics of discussion included: Pesticide Residues in Our Food Supply; Health Fraud; Infectious Waste; Hazardous Waste; Radon; Organic Foods; International Epidemiology; and Child Care.

Conference attendees heard updates from the FDA & USDA concerning the internal changes occurring within the agencies. Food issues were also discussed including the National Labeling & Education Act of 1990, HACCP, Vacuum Packaging, and a pilot program to help Wyoming food processors.

This was also the first year we involved industry people. They set up booths in the terrace area to display their innovative products and services.

Tennessee President Ed Miller presiding.

The Tennessee Association of Milk, Water and Food Protection Meets

The fall meeting of the Tennessee Association of Milk, Water and Food Protection was held November 6, 1991, at the Ellington Agricultural Center, Nashville, TN with Ed Miller, President, presiding. Sixty-eight members and guests were welcomed by Tennessee Commissioner of Agriculture, L. H. "Cotton" Ivy.

Dr. Melvin Newman of the University of Tennessee, Jackson, TN, spoke on Preventing Aflatoxin in Feed.

Taylor Freeman of Idexx Corporation, spoke on Screening Tests for Residues in Milk.

Dr. Hugh McCampbell of the University of Tennessee, Knoxville, spoke on the Milk and Dairy Beef Quality Assurance Program.

Jerry Baggett served as door prize chairman with Teresa Graves of the Tennessee Department of Agriculture winning the grand prize, a Tennessee country ham.

The meeting was concluded with a tour of Cumberland Creamery, Inc., - a new butter/powder plant in Antioch, Tennessee.

Jerry Baggett presents the grand door prize - a Tennessee country ham to Teresa Graves.

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Updates . . .

Happy Holidays from the Ames Office Staff!

The staff of the International Association of Milk, Food and Environmental Sanitarians wish you Happy Holidays! Pictured from left to right: Dolores Taylor, Bookkeeper; Trisha Lynn, Advertising Account Executive; Chris Ricke, Publications Specialist; Vicki Link, Receptionist; Margie Marble, Assistant Executive Manager/Editor of *Dairy, Food and Environmental Sanitation*; Lori Whitmer, Advertising Account Executive; Lynn Henry, Assistant to the Bookkeeper; Steve Halstead, Executive Manager; Holly Westercamp, Advertising Account Executive; Scott Wells, Advertising Manager/Exhibit Coordinator; Rebecca Schirer, Assistant to the Advertising Manager; Joel Rybolt, Membership Sales; Diann Voigt, Assistant to the Executive Manager; Julie Heim, Meeting/Publications Coordinator. Not pictured, Dee Buske, Affiliate Liaison; Michelle Wolff, Journal Typist.

Meat Scam Returns to State

WDA press release, November 5, 1991

The Wyoming Department of Agriculture (WDA) and the Better Business Bureau (BBB) are warning Wyoming consumers about a possible meat scam operation selling substandard meat in the state.

WDA and BBB officials were alerted to the scam this morning (November 5) after Cheyenne school personnel reported two men in white vans operating under the name "Steaks-R-Us" selling surplus ribeye and New York Strip steaks. The vans had Colorado license plates, school officials said.

"We believe this is the same business that was operating a similar meat scam in the region earlier this year under the name "Steak Pak," said John Misock.

"Their mode of operation is to tell perspective consumers that they've just finished making deliveries to other accounts and have surplus meat available at discount before they return to their business in Colorado," Misock said. "For the unwitting customer, this looks like a real good deal. In fact, the products are substandard quality, possibly adulterated and misbranded, according to Misock.

Last summer the WDA filed a complaint against "Steak Pak" in the Park County's Fifth Judicial District which prohibited the company from selling substandard meat products in the state. It also required them to notify the clerk of court in the Fifth Judicial District of any future meat selling activity in this state.

WDA is attempting to secure a restraining order which would prohibit "Steaks-R-Us" from further illegal product sales.

There are a number of reputable firms in the business of door-to-door sales, but the buyer should beware of purchasing products from an unknown business. The Better Business Bureau advises consumers to be cautious of freezer meat sold door-to-door, especially if distress pitches are used. Take the time to comparison shop and check out the seller by calling the BBB or WDA.

Reprinted from The Sanitator, Autumn, 1991, Wyoming Public Health Sanitarians Association.

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Deadline for Listings: January 3, 1992

Dairy, Food and Environmental Sanitation, Vol. 11, No. 12, Pages 753-758 (December 1991)
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3-A Sanitary Standards For Fittings Used On Milk And Milk Products Equipment And Used On Sanitary Lines Conducting Milk and Milk Products, Number 08-17M Part One

[Vacuum Breakers and Check Valves]

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Sanitary vacuum breakers and check valves specifications heretofore or hereafter developed which so differ in design, material, and fabrication, or otherwise as not to conform with the following standards but which, in the manufacturer's or fabricator's opinion are equivalent or better may be submitted for the joint consideration of IAMFES, USPHS, and DIC at any time. These Sanitary Standards are in two parts. Part One contains the text. Part Two contains the drawings.

A

SCOPE

A.1

These standards cover the sanitary aspects of vacuum breakers and check valves used on processing equipment and on equipment and lines which hold or convey milk or milk products. See Appendix, Section H for drawings numbered 3-A-100M-1, 3-A-100M-2, 3-A-100M-3, 3-A-100M-4 and 3-A-100M-5.

A.2

In order to conform to these 3-A Sanitary Standards, vacuum breakers and check valves shall comply with the following design, material and fabrication criteria.

B

DEFINITIONS

B.1

Product: Shall mean milk and milk products.

B.2

Surfaces

B.2.1

Product Contact Surfaces: Shall mean all surfaces which are exposed to the product or from which liquid may drain, drop or be drawn into the product.

B.2.2

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

B.3

Mechanical Cleaning or Mechanically Cleaned: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

C

MATERIALS

C.1

Product contact surfaces shall be of stainless steel of the AISI 300 Series*1 or corresponding ACI*2 types (See Appendix, Section F.) or metal which under conditions of intended use is equally corrosion-resistant as stainless steel of the foregoing type, and is non-toxic and non-absorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for gaskets, O-Rings, seals, check valve seats, balls, diaphragms, flappers and parts having the same functional purposes.

C.1.2

Rubber and rubber-like materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-00.

C.1.3

Plastic materials may be used for gaskets, O-Rings, seals, check valves seats, balls, diaphragms, flappers and parts having the same functional purposes.

C.1.4

Plastic materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use

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*1 *The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, December 1974, Table 2-1, pp. 18-20. Available from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412-776-9460).*

*2 *Alloy Casting Institute Division, Steel Founders Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016 (708-299-9160).*

Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-14 as amended.

C.1.5

Bonded rubber and rubber-like materials and bonded plastic materials, if used, having product contact surfaces that are a bonded coating or a covering shall be of such a composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C.1.6

The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be non-toxic.*3

C.1.7

In a processing system to be sterilized by heat and operated at a temperature of 250 degrees F (121 C) or higher, all materials having a product contact surface(s) used in the construction of fittings, gaskets and non-metallic component parts shall be such that they can be (1) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250 degrees F (121 C) and (2) operated at the temperature required for processing.

C.2

Non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces shall not be painted.

D

FABRICATION

D.1

All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds, and crevices in the final fabricated form. (See Appendix, Section G.)

D.2

All permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds, and crevices.

D.3

Vacuum breakers and check valves that are to be mechanically cleaned shall be designed so that the product contact surfaces of the vacuum breakers and check valves and all non-removable appurtenances thereto can be mechanically cleaned and are easily accessible for inspection.

D.4

Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an assembled position or when removed. Removable parts shall be readily demountable.

D.5

All product contact surfaces shall be self-draining, except for normal clingage, when properly installed.

D.6

All sanitary fittings and connections shall conform with the applicable provisions of 3-A Sanitary Standards for Fittings used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Parts I and II, 08-17 as amended.

D.7

All tubing shall comply with the applicable provisions for welded sanitary product pipelines found in the 3-A Accepted Practices for Permanently Installed Sanitary Product Pipelines and Cleaning Systems with Amendment, Number 605-03, and/or with 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-00.

D.8

Gaskets

D.8.1

Gaskets having a product contact surface shall be removable or bonded.

D.8.2

Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

D.8.3

Grooves in gaskets shall be no deeper than their width, unless the gasket is readily removable and reversible for cleaning.

D.8.4

Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6 mm) in depth or be less than 1/4 in. (6 mm) wide except those for standard O-Rings smaller than 1/4 in. (6 mm).

D.9

Radii

D.9.1

All internal angles of 135 degrees or less on product contact surfaces, including gasket grooves, gasket retaining grooves or grooves in gaskets, shall have radii of not less than 1/16 in. (2 mm) except that:

D.9.1.1

The radii in grooves for standard 1/4 in. (6 mm) O-Rings shall not be less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) O-Rings shall be not less than 1/32 in. (1 mm).

D.9.1.2

The minimum radii for fillets of welds in product

*3 *Adhesives shall comply with 21 CFR Part 175 - Indirect food additives: Adhesives and components of coatings. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 60402 (202-783-3238).*

contact surfaces shall not be less than 1/4 in. (6 mm) except that the minimum radii for such welds may be 1/8 in. (3 mm) when the thickness of one or both parts joined is less than 3/16 in. (5 mm).

D.10

There shall be no threads on product contact surfaces.

D.11

Any coil spring(s) having product contact surfaces shall have at least 3/32 in. (2 mm) openings between the coils, including the ends, when the spring(s) is in the free position.

D.11.1

Spring(s), if used, in vacuum breakers shall be of a design dedicated for this use and are easily identifiable.

D.12

Check valves and vacuum breakers may have metal-to-metal, or rubber or rubber-like or plastic materials to metal seats.

D.13

Non-product contact surfaces shall have a smooth finish, free of pockets and crevices and be readily cleanable, and those surfaces to be coated shall be effectively prepared for coating.

E

SPECIAL CONSIDERATIONS

E.1

Check valves used in a processing system to be sterilized by heat and operated at a temperature of 250 degrees F (121 degrees C) or higher shall comply with the following additional criteria:

E.1.1

The construction shall be such that all product contact surfaces can be (l) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250 degrees F (121 degrees C) and (2) operate at the temperature required for processing.

APPENDIX

F

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C.l herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08 percent. The first reference cited in C.i sets forth the chemical ranges and limits of acceptable stainless steel of the 300 series. Cast grades of stainless steel corresponding to type 303, 304, and 316 are designated CF-16F, CF-8 and CF-8M, respectively. These cast grades are covered by ASTM*4 specifications, A351/A351M, A743/A743M, and A744/A744M.

G

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section D.l herein.

H

DRAWINGS

This APPENDIX is continued in Part Two of these 3-A Sanitary Standards which contains drawings of vacuum breakers and check valves.

These standards shall become effective June 30, 1992.

**4 Available from ASTM, 1916 Race St., Philadelphia, PA 19103-1187 (215-299-5400).*

Part Two Of The 3-A Sanitary Standards For Fittings Used On Milk And Milk Products Equipment And Used On Sanitary Lines Conducting Milk and Milk Products, Number 08-17M

[Vacuum Breakers and Check Valves]

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

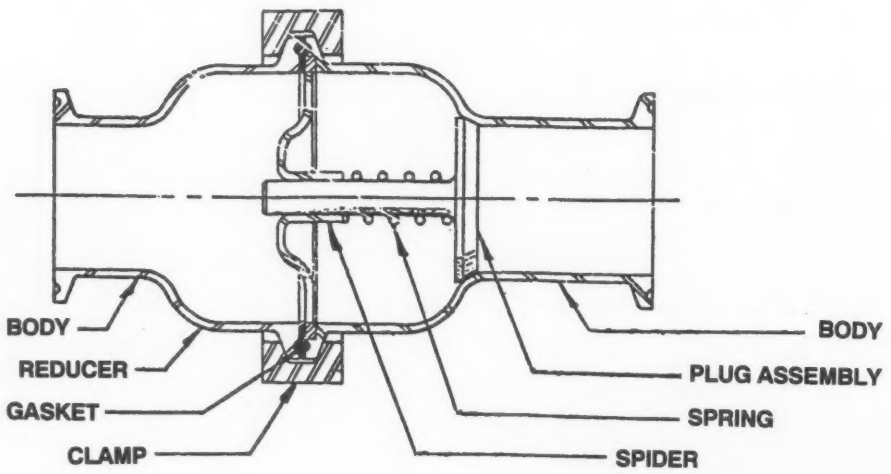
It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Sanitary vacuum breakers and check valves specifications heretofore or hereafter developed which so differ in design, material, and fabrication, or otherwise as not to conform with the following standards but which, in the manufacturer's or fabricator's opinion are equivalent or better may be submitted for the joint consideration of IAMFES, USPHS, and DIC at any time. These 3-A Sanitary Standards are in two parts. Part One contains the text. Part Two contains the drawings.

APPENDIX

H

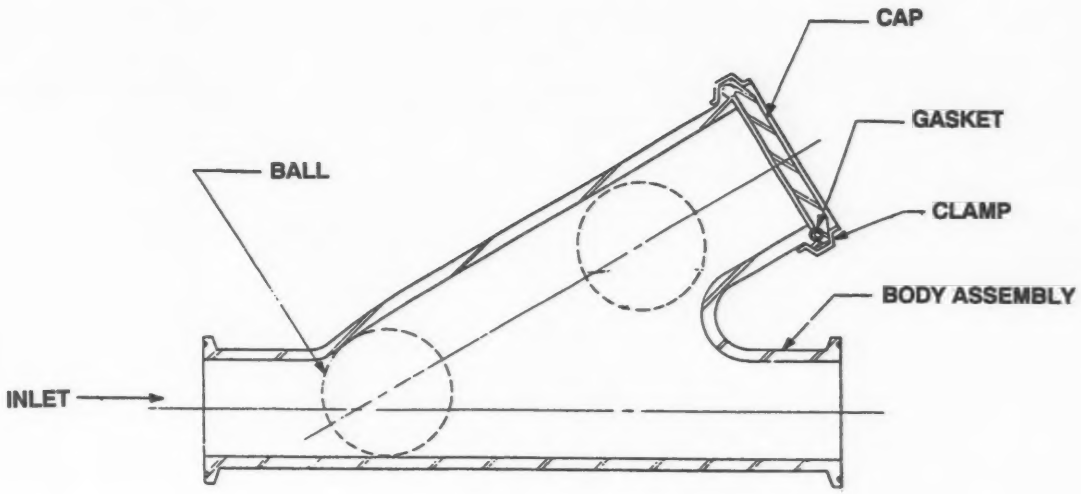
DRAWINGS OF 3-A SANITARY FITTINGS FOR VACUUM BREAKERS & CHECK VALVES
Drawings of the following are included in this Appendix:

Fitting Name	Page	3-A Drawing Number
Spring Loaded Check Valve	756	3-A-100M-1
Ball-Type Check Valve	757	3-A-100M-2
Spring Loaded Vacuum Breaker	757	3-A-100M-3
Non-Spring Loaded Vacuum Breaker	758	3-A-100M-4
Non-Spring Loaded Vacuum Breaker	758	3-A-100M-5



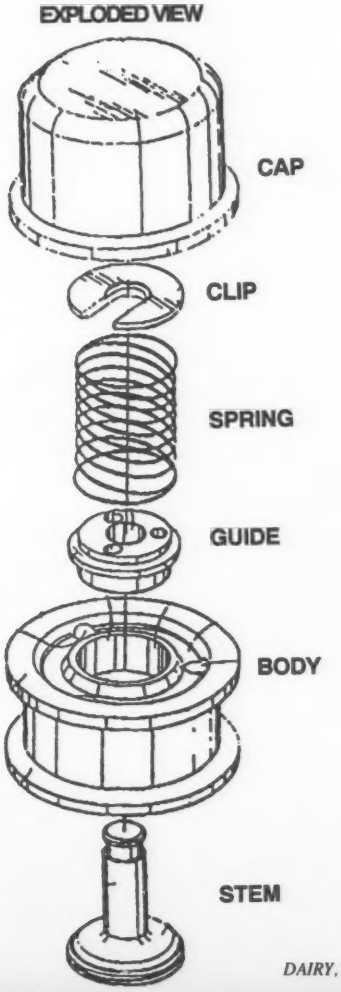
Spring Loaded Check Valve

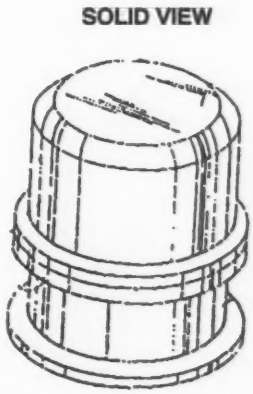
3-A Sanitary Fitting 3-A-100M-1



Ball-Type Check Valve

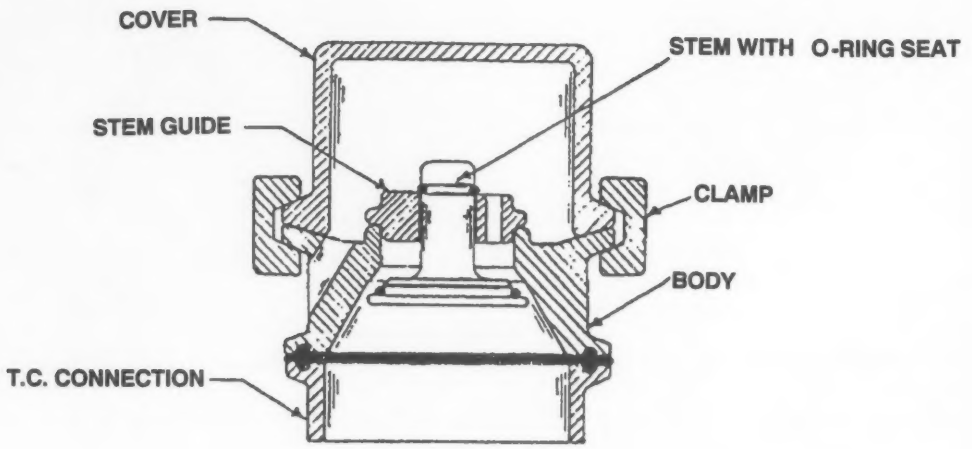
3-A
Sanitary Fitting
3-A-100M-2





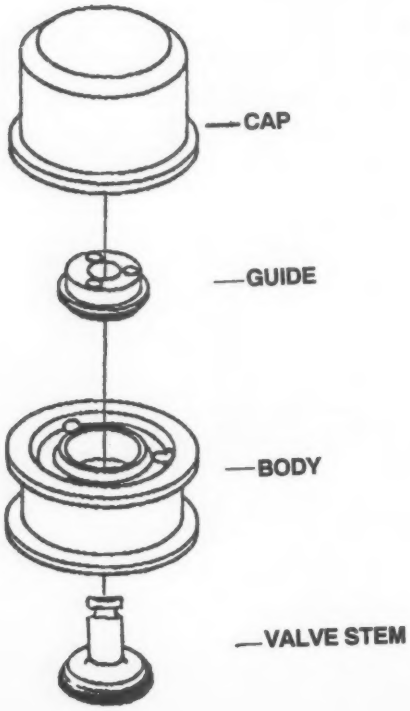
Spring Loaded Vacuum Breaker

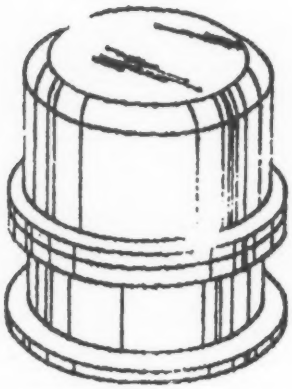
3-A
Sanitary Fitting
3-A-100M-3



Non-Spring Loaded Vacuum Breaker

3-A
Sanitary Fitting
3-A-100M-4





Non-Spring Loaded Check Valve

3-A
Sanitary Fitting
3-A-100M-5

Dairy, Food and Environmental Sanitation, Vol. 11, No. 12, Page 759 (December 1991)
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Amendments To Parts One And Two Of The 3-A Sanitary Standards For Fittings Used On Milk And Milk Products Equipment Used On Sanitary Lines Conducting Milk And Milk Products, Number 08-17 As Amended

08-20 REV.

[Fittings and Plug Type Valves]

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Fittings and plug type valves specifications heretofore or hereafter developed which so differ in design, material, and fabrication, or otherwise as not to conform with the following standards but which, in the manufacturer's or fabricator's opinion are equivalent or better may be submitted for the joint consideration of IAMFES, USPHS, and DIC at any time.

D.6

Removable fittings may be used with or without gaskets or O-Rings and shall be of such design as to form flush interior joints.

E

SPECIAL CONSIDERATIONS

E.1

Special sanitary fittings may be used where interchangeability is not required. These special fittings must conform to the provisions of these standards with respect to material finish, construction, thread dimensions (if used) and use of gaskets but do not have to conform to the face-to-face or center line-to-face dimensions in the drawings. All product contact surfaces of such fittings shall be accessible for cleaning and inspection. All internal angles on product contact surfaces shall have radii of not less than 1/16 in. (2 mm) except that: (1) gasket recesses and grooves, in which all sharp corners shall be avoided, and (2) fittings less than 1 in. (25 mm) in size shall have a radii of not less than 1/32 in. (1 mm).

E.1.1

For special applications involving high pressure systems (greater than 250 psig/1750 kPg) with pipe or tube size of 1 in. (25 mm) outside diameter and under, American National Standard Unified Threads ("Vee-Threads") may be used on special fittings. Threads shall conform to ANSI B1.1 as indicated on Table 3A-100-44 contained in Part Two of these standards.

These amendments shall become effective June 30, 1992.

Amendments To Parts One And Two Of The 3-A Sanitary Standards For Fittings Used On Milk And Milk Products Equipment Used On Sanitary Lines Conducting Milk And Milk Products, Number 08-17 As Amended

08-20 REV.

[Fittings and Plug Type Valves]

SANITARY FITTINGS 3-A STANDARD NO. 08-20 REV.
UNIFIED SCREW THREAD SPECIFICATION HIGH PRESSURE APPLICATIONS

TUBE SIZE INCH	THREAD SIZES	THREADS PER INCH	THREAD CLASS	
			EXTERNAL	INTERNAL
1/4	9/16	18, 20	2A, 3A	2B
3/8	3/4	20	2A, 3A	2B
3/8	7/8	14	2A, 3A	2B
1/2	7/8	14, 20	2A, 3A	2B
5/8	1	14, 20	2A, 3A	2B
3/4	1-1/4	18	2A, 3A	2B
3/4	1-5/16	20	2A, 3A	2B
1	1-1/2	20	2A, 3A	2B

NOTE: ALL THREAD DIMENSIONS AND TOLERANCES MUST COMPLY WITH AMERICAN NATIONAL STANDARD ANSI B 1.1 ENTITLED "UNIFIED INCH SCREW THREADS."

3-A STANDARD SANITARY FITTINGS 3-A-100-44

Dairy, Food and Environmental Sanitation, Vol. 11, No. 12, Pages 760-762 (December 1991)
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3-A Sanitary Standards For Air Eliminators for Milk And Fluid Milk Products, Number 29-01

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Air eliminators specifications heretofore and hereafter developed which so differ in design, material, fabrication, or otherwise as not to conform with the following standards, but which, in the fabricator's opinion are equivalent or better, may be submitted for joint consideration of the IAMFES, USPHS, and DIC, at any time.

A

SCOPE

A.1

These standards cover the sanitary aspects of air eliminators for milk and fluid milk products. These standards do not apply to air eliminators using vacuum to remove air.

A.2

In order to conform with these 3-A Sanitary Standards, air eliminators shall comply with the following design, material and fabrication criteria.

B

DEFINITIONS

B.1

Product: Shall mean milk and fluid milk products.

B.2

Surfaces

B.2.1

Product Contact Surfaces: Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop, or be drawn into the product.

B.2.2

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

B.3

Mechanical Cleaning or Mechanically Cleaned: Shall denote cleaning solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

C

MATERIALS

C.1

All product contact surfaces shall be of stainless steel of the AISI 300 Series[*1] or corresponding ACI[*2] types (See Appendix, Section E.) or metal which under the conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types and is non-toxic and non-absorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for O-Rings, gaskets, seals, protective caps for openings, valve parts and parts having the same functional purposes.

C.1.2

Rubber and rubber-like materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials, Used as Product Contact Surfaces in Dairy Equipment, Number 18-00.

C.1.3

Plastic materials may be used for valve parts, gaskets, seals, O-Rings, protective caps for openings and parts having the same functional purposes.

C.1.4

Plastic materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-14 as amended.

C.1.5

Bonded rubber and rubber-like materials and bonded plastic materials having product-contact surfaces shall be of such a composition as to retain their surface and conformational characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.1.6

The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be non-toxic.[*3]

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*[*1] The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, December 1974, Table 2-1, pp. 18-20. Available from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412-776-9460).*
*[*2] Steel Founders Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016 (708-299-9160).*

C.2

Non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces shall not be painted.

D

FABRICATION

D.1

All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds, and crevices in the final fabricated form. (See Appendix, Section F.)

D.2

All permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds, and crevices.

D.3

Air eliminators that are to be mechanically cleaned shall be designed so that the product contact surfaces of the air eliminator and all non-removable appurtenances thereto can be mechanically cleaned and are easily accessible for inspection.

D.4

Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an assembled position or when removed. Removable parts shall be readily demountable.

D.5

All product contact surfaces shall be self-draining except for normal clingage.

D.6

Gaskets and Seals

D.6.1

Gaskets and seals having a product contact surface shall be removable or bonded.

D.6.2

Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

D.6.3

Grooves in gaskets shall be no deeper than their width, unless the gasket is readily removable and reversible for cleaning.

D.6.4

Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6 mm) in depth or be less than 1/4 in. (6 mm) wide except those for standard O-Rings smaller than 1/4 in. (6 mm).

D.7

Radii

D.7.1

All internal angles of 135 degrees or less on product contact surfaces shall have radii of not less than 1/4 in. (6 mm) except that:

D.7.1.1

Smaller radii may be used when they are required for essential functional reasons, such as those in vent seal parts. In no case shall such radii be less than 1/32 in. (1 mm).

D.7.1.2

The radii in gasket grooves, gasket retaining grooves, or grooves in gaskets, except for those for standard 1/4 in. (6 mm) and smaller O-Rings, shall be not less than 1/8 in. (3 mm).

D.7.1.3

The radii in grooves for standard 1/4 in. (6 mm) O-Rings shall not be less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) O-Rings shall be not less than 1/32 in. (1 mm).

D.7.1.4

The minimum radii for fillets of welds in product contact surfaces shall be not less than 1/4 in. (6 mm) except that the minimum radii for such welds may be 1/8 in. (3 mm) when the thickness of one or both parts joined is less than 3/16 in. (5 mm).

D.8

There shall be no threads on product contact surfaces.

D.9

Sanitary fittings and connections shall conform to the applicable provisions of the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Parts I and II Number 08-17 as amended, except that the materials conforming to C.1.2 or C.1.4 may be used for caps of sanitary design for the protection of terminal ends of sanitary tubing, fittings, or vents.

D.10

Sanitary tubing shall conform to the applicable provisions of the 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-00.

D.11

Air vents shall be designed or protection provided to prevent foreign material from entering the air eliminator through the air vent.

D.12

Pressure and/or level sensing devices shall conform to the applicable provisions of 3-A Sanitary Standards for Pressure and Level Sensing Devices, Number 37-01.

D.13

The means of supporting an air eliminator shall be by legs. Legs shall be smooth with rounded ends and no

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**3 Adhesives shall comply with 21 CFR Part 175 - Indirect food additives. Adhesives and components of coatings. Document for sale by the Superintendent of Documents, U.S. Government Office, Washington, DC 20402 (202-783-3238).*

exposed threads. Legs made of hollow stock shall be sealed. The clearance between the lowest part of the air eliminator (excluding legs) and the floor shall be one of the following:

D.13.1

Not less than 4 in. (100 mm) if the horizontal area of the air eliminator is more than 1 sq ft (0.09 sq m).

D.13.2

Not less than 2 in. (50 mm) if the horizontal area of the air eliminator is not more than 1 sq ft (0.09 sq m) and the air eliminator is designed to be portable and easily movable.

D.14

Non-product contact surfaces shall have a smooth finish and be free of pockets and crevices and be readily cleanable and those surfaces to be coated shall be effectively prepared for coating.

APPENDIX

E

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI[*1] for wrought products, or by ACI[*2] for cast products, should be considered in compliance with the requirements of Section C1 herein. Where welding is involved the carbon content of the stainless steel should not exceed 0.08 percent. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steels of the 300 Series. Cast grades of stainless steel equivalent to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. These cast grades are covered by ASTM[*4] specifications A351/A351M, A743/A743M and A744/A744M.

F

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section D.1 herein.

[*4] *Available from ASTM, 1916 Race St., Philadelphia, PA 19103-1187 (215-299-5400).*

These standards shall become effective June 30, 1992.

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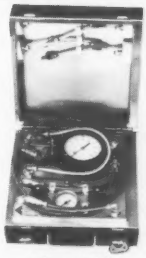

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1992

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•**23-24, Preparing for Change: Labeling Dairy Products Workshop**, sponsored by the International Dairy Foods Association, to be held at the Crystal Gateway Marriott, Washington, DC. For more information contact the IDFA Marketing & Training Institute, 888 Sixteenth Street, NW, 2nd floor, Washington, DC 20006-4103, (202)296-4250.

•**30-31, Preparing for Change: Labeling Dairy Products Workshop**, sponsored by the International Dairy Foods Association, to be held at the Westin Hotel O'Hare, Chicago, IL. For more information contact the IDFA Marketing & Training Institute, 888 Sixteenth Street, NW, 2nd floor, Washington, DC 20006-4103, (202)296-4250.

February

•**3-4, Preparing for Change: Labeling Dairy Products Workshop**, sponsored by the International Dairy Foods Association, to be held at the Stouffer Concourse Hotel, Los Angeles, CA. For more information contact the IDFA Marketing & Training Institute, 888 Sixteenth Street, NW, 2nd floor, Washington, DC 20006-4103, (202)296-4250.

•**3-6, Freezing Technology Short Course,** sponsored by the University of California-Davis, Davis, CA. Contact: Sharon Munowitch, University Extension, University of California, Davis, CA 95616-8727, (916)757-8896.

•**9-12, Pacific Fisheries Technologists 43rd Annual Meeting** to be held at the Sheraton Hotel, San Pedro, California. For further information, contact: Pamela Tom, Food Science & Technology Dept., University of California, Davis, CA 95616-8598. Telephone: (916)752-3837; FAX: (916)752-4759.

•**9-12, 1992 Winter Conference - Pollution Prevention through Waste Minimization**, sponsored by the National Environmental Health Association, will be held at the Hyatt Regency, Denver, CO. For more information contact NEHA, 720 S. Colorado Blvd., Suite 970, Denver, CO 80222-1925; (303)756-9090 or FAX (303)691-9490.

•**10-12, National Mastitis Council 31st Annual Meeting** to be held at the Crystal City Hyatt in Arlington, Virginia. For more information contact Anne Saeman, Director of Operations, National Mastitis Council, 1840 Wilson Blvd., Suite 400, Arlington, VA 22201, Phone: (703)243-8268, FAX (703)243-8268.

•**11-13, FDA Course on Food Code Interpretations** to be held at the Townhouse Fargo, Fargo, ND. For preregistration information contact Deb Larson, ND Dept of Health and Consolidated Labs, P.O. Box 937, Bismarck, ND 58502; phone: (701)221-6147.

•**12-13, Dairy and Food Industry Conference** will be held at The Ohio State University, Department of Food Science and Technology, 2121 Fyffe Road, Columbus, Ohio 43210-1097. For more information contact John Lindamood at (614)292-7765.

•**28, Baking Industry Sanitation Standards Committee Annual Membership Meeting** to be held at the Chicago Marriott Hotel, Chicago, IL. For more information, contact the BISSC headquarters at 401 North Michigan Avenue, Chicago, IL 60611; (312)644-6610.

March

•**6, The 1992 National Frozen Food Month Kick-Off Dinner**, sponsored by the Central Indiana Frozen Foods Association, will be held at the Indiana Roof Ballroom, Indianapolis, IN. For more information contact the Central Indiana Frozen Foods Association, Attention: Gerald Carter, P. O. Box 50872, Indianapolis, IN 46250; (317)842-7700.

•**11, U. W. Dairy Manufacturer's Conference**, sponsored by the University of Wisconsin-Extension, will be held at The Paper Valley Hotel, Appleton, WI. For more information, contact Bill Wendorff, Dept. of Food Science, 1605 Linden Drive, Madison, WI 53706; (608)263-2015.

•**16-18, Food Product Development/Ingredient Technology,** sponsored by the University of California-Davis, Davis, CA. Contact: Sharon Munowitch, University Extension, University of California, Davis, CA 95616-8727, (916)757-8896.

•**16-19, Better Process Control School,** sponsored by the University of California-Davis, Davis, CA. Contact: Sharon Munowitch, University Extension, University of California, Davis, CA 95616-8727, (916)757-8896.

•**18, Indiana Dairy Industry Conference** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, Phone: (317)494-8279.

•**23-27, Midwest Workshop in Milk, Food and Environmental Sanitation** will be held at The Ohio State University, Department of Food Science and Technology, 2121 Fyffe Road, Columbus, OH 43210-1097. For more information contact David Dzurec at (614)292-7723.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666.

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107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

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The Color of Money

The 42-Hour Salmonella Test Kit

When it comes to salmonella testing, the sooner you know your results, the sooner you ship your product. Which is why the few moments you spend learning about Oxoid's new Salmonella Rapid Test Kit could pay big dividends.

Now, from the start of incubation, you'll be able to read results in just 42 hours — less than half the time of conventional culture methods. That means food cleared for processing and ready for shipping one or two days faster than at present. We leave it to you to calculate the money saved.

The Oxoid Salmonella Rapid Test Kit does *not* compromise traditional culture procedures. On the contrary, it enhances their reliability by providing *two* selective media and *two* indicators. Just what you'd expect from Oxoid, a world leader in the development of improved methods of testing for micro-organisms in food.

Not only is the Oxoid test procedure easy to master, it also offers an unmatched level of safety by reducing the number of times samples have to be handled. And safety is further insured by the disposable Oxoid culture vessel — one less piece of contaminated equipment to clean.

If time really is money (and it *is*), it will pay you to find out more about this remarkable new Oxoid product. Write today for additional information. Or, faster yet, phone 1-800-638-7638.

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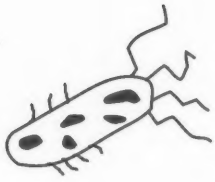
Easy as...

A Bacteria Testing

- 8 minute test
- 10^3 - 10^5 bacteria/ml



B Shelf Life Prediction

- Results in 24 hours
- 10 - 16 day shelf life prediction

C Sanitation Test

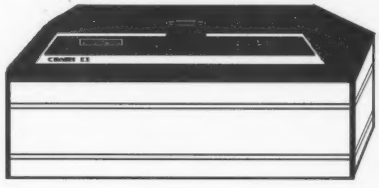
1 minute test for:

- Industrial sanitation
- Food processing
- Water quality

Introducing the **Charm ABC (Active Bacteria Count)** using the standard Charm II System...***no additional equipment required!***

Antibiotics, aflatoxin, alkaline phosphatase...
and now bacteria counts.

Nothing works like a Charm II!



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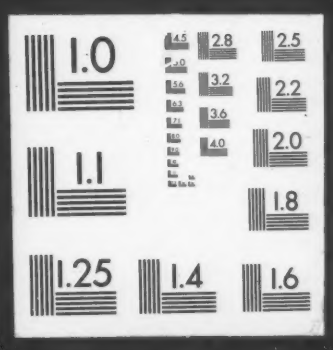
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